

## **Appendix L**

### **CHART Assessment for the Upper Willamette River Steelhead ESU**

#### **CHART Participants**

The CHART for this ESU consisted of the following NOAA Fisheries biologists: Ben Meyer (CHART Leader), Michelle Day, Patty Dornbusch, Dan Guy, Lynne Krasnow, Lance Kruzic, Nancy Munn, Mindy Simmons, Cathy Tortorici, and Rich Turner. This CHART assessment also benefitted from review and comments from the Oregon Department of Fish and Wildlife.

#### **ESU Description**

The Upper Willamette River steelhead ESU was listed as a threatened species in 1999 (64 FR 14517; March 25, 1999). The ESU includes all naturally spawned populations of winter-run steelhead in the Willamette River, Oregon, and its tributaries upstream from Willamette Falls to the Calapooia River (inclusive). The agency recently conducted a review to update the ESU's status, taking into account new information, evaluating component resident rainbow trout populations, and considering the net contribution of artificial propagation efforts in the ESU. We have proposed that Upper Willamette River *O. mykiss* remain listed as threatened (69 FR 33102; June 14, 2004). Additionally, we have proposed that the listing include resident populations of *O. mykiss* below impassible barriers (natural and manmade) that co-occur with anadromous populations. The final listing determination for all *O. mykiss* ESUs was extended by six months (70 FR 37219, June 28, 2005), therefore the CHART's assessment focused on the anadromous range of *O. mykiss*.

The following description is based largely on excerpts from the Willamette/Lower Columbia River Technical Recovery Team's (TRT) recent review of historical population structure for this ESU (Myers et al. 2003). Of the three temporal runs of steelhead currently found in the Upper Willamette River ESU only the late-run winter steelhead is considered to be native. The same flow conditions at Willamette Falls that only provided access for spring-run Chinook salmon also provided an isolating mechanism for this unique run time of steelhead. The predominant tributaries to the Willamette River that historically supported winter steelhead all drain the Cascade Range. The TRT has identified most of these drainages as a historically demographically independent population (DIP): Molalla, North Santiam, South Santiam, and Calapooia rivers. Steelhead populations in the upper Willamette River basin have been strongly influenced by extensive hatchery transfers of fish throughout the ESU and the introduction of

summer-run steelhead (facilitated by the laddering of Willamette Falls). Summer-run steelhead are still stocked in the upper Willamette River, but the stocking of winter-run steelhead in the Willamette River has been discontinued (although non-native winter-run fish still return).

It is generally agreed that steelhead did not historically emigrate farther upstream than the Calapooia River. Although there are no obvious physical barriers separating populations upstream of the Calapooia from those lower in the basin, resident *O. mykiss* in these upper basins are quite distinctive both phenotypically and genetically and are not considered part of the ESU. Hatchery summer steelhead occur in the Willamette Basin, but are an out-of-basin stock that is not included as part of the ESU. Also, the TRT reviewed evidence of steelhead using westside tributaries to the Willamette River and concluded that “with the exception of the Tualatin River, there is little evidence to suggest that sustained spawning aggregations of steelhead may have existed historically in the westside tributaries of the Willamette River basin. Furthermore, it is unlikely that these tributaries, individually or collectively were large enough to constitute a DIP.

Late-run upper Willamette River winter steelhead are considered an ocean-maturing type of steelhead in that they enter fresh water with well-developed gonads and typically spawn shortly thereafter. Maturing fish enter the Willamette River beginning in January and February, but do not ascend to their spawning areas until late March or April. Spawning takes place from April to June, typically peaking in May and occurs in both mainstem and tributary habitats in the major Cascade drainages identified above. Presently, native steelhead are distributed in a few, relatively small, naturally spawning aggregations.

The juvenile life-history characteristics of Upper Willamette River steelhead are summarized (where known) in ODFW (1990) and Olsen et al. (1992). In the subbasins reviewed, egg/alevin incubation and fry emergence occurred from April to August. Juveniles spend two winters rearing in freshwater before emigrating to the ocean from March to July. Upper Willamette River winter steelhead typically spawn as 4 year olds after two years in the ocean.

### **Recovery Planning Status**

The Willamette-Lower Columbia River TRT has identified four historical demographically independent populations of Upper Willamette River steelhead: the Mollala River, North Santiam River, South Santiam River, and Calapooia River populations (Myers et al. 2003). The TRT also notes that spawning winter-run steelhead have been observed in the Westside tributaries to the Upper Willamette River, however,

the Westside tributaries are not considered to have historically constituted a demographically independent population (Myers et al. 2003). The TRT has determined that the Upper Willamette River *O. mykiss* ESU populations comprise a single life-history type (winter-run fish) and ecological zone (Willamette River) (McElhany et al. 2002). Recovery planning will likely emphasize the need for a geographical distribution of viable populations across the geographical range of the four populations in this ESU (Ruckelshaus et al. 2002, McElhany et al. 2003). A preliminary draft recovery plan for this ESU is expected by the end of 2005. This plan will be based on the Willamette subbasin plan, which was completed in May 2004. The CHART considered the TRT products in rating each watershed, but did not have the benefit of a recovery plan. We anticipate that, as recovery planning proceeds, we will have better information and may revise our recommendations for regarding critical habitat designation.

### **CHART Area Assessments**

The CHART assessment for this ESU addressed 7 subbasins containing 34 occupied watersheds, as well as the lower Willamette/Columbia River rearing/migration corridor. As noted above, the Upper Willamette River steelhead ESU consists of a single stratum due to it being a single run type (winter-run fish) that spawns within a single ecological zone (Willamette River). Therefore, as part of its assessment the CHART considered the conservation value of each HUC5 in the context of the populations within this stratum. Information is presented below by USGS subbasin because they present a convenient and systematic way to organize the CHART's watershed assessments for this ESU and their names are generally more recognizable because they typically identify major river systems.

### **Upper Willamette Subbasin (HUC4# 17090003)**

The Upper Willamette subbasin contains both eastside and westside drainages as well as the mainstem Willamette River upstream of its confluence with the Santiam River. The subbasin is contained

in the following Oregon counties: Benton, Linn, and Polk. Some areas of the subbasin also occur in Lane and Lincoln counties but these are outside the range of the ESU. The subbasin contains six watersheds, three of which are occupied by this ESU and encompass approximately 765 mi<sup>2</sup> and 953 miles of streams. Fish distribution and habitat use data from the Oregon Department of Fish and Wildlife (ODFW) identify approximately 241 miles of occupied riverine habitat in the watersheds (ODFW 2003A,B). Myers et al. (2003) identified possibly two demographically independent populations in this subbasin (the CHART questioned the South Santiam population's presence here), but only one with spawning habitat (Calapooia River). Myers et al.

(2003) also noted that there is considerable debate about the origin of naturally spawning winter-run steelhead currently found in several westside tributaries. These authors went on to state that (with the exception of the Tualatin River) “there is little evidence to suggest that sustained spawning aggregations of steelhead may have existed historically in the westside tributaries of the Willamette River basin. Furthermore, it is unlikely that these tributaries, individually or collectively were large enough to constitute a DIP [demographically independent population].”

The CHART concluded that, despite uncertainties regarding the population status of steelhead in the watersheds in this subbasin, both likely contain one or more PCEs for this ESU. Table L1 summarizes the total number of occupied reaches identified for each HUC5 watershed as containing spawning, rearing, or migration PCEs, as well as management activities that may affect the PCEs in the watersheds. Map L1 depicts the specific areas in this subbasin occupied by the ESU and under consideration for critical habitat designation.

After reviewing the best available scientific data for all of the areas within the freshwater and estuarine range of this ESU, the CHART concluded that one of the occupied HUC5 watersheds (Calapooia River) in this subbasin was of high and two were of medium conservation value to the ESU. The CHART also concluded that all reaches of the Willamette River within this subbasin constitute a high value rearing and migration corridor for the Calapooia River population with downstream reaches and the ocean. The CHART noted that, given the limited number of populations in this ESU, westside habitats in this subbasin may provide some conservation benefits to the ESU (e.g., as a buffer against a catastrophic event affecting Cascade watersheds). In that context, the CHART concluded that the Luckiamute River HUC5 may have the highest potential conservation benefit in this subbasin and therefore assigned it a provisional medium conservation value. Table L2 summarizes the CHART’s PCE/watershed scores and conservation value ratings, and Figure L1 shows the overall distribution of ratings by HUC5 watershed. Among the key considerations identified in Table L2, the CHART noted that the Calapooia River HUC5 was the only one identified as having spawning habitat supporting a demographically independent population in this subbasin.

#### **North Santiam River Subbasin (HUC4# 17090005)**

The North Santiam River subbasin is a Cascade Range drainage of the Upper Willamette River and contained in Clackamas, Linn, and Marion counties, Oregon. The subbasin contains six watersheds, three of which are occupied by this ESU and encompass approximately 315 mi<sup>2</sup> and 340 miles of streams. Fish distribution and habitat use data from ODFW identify approximately 137 miles of occupied riverine habitat in these

watersheds (ODFW 2003A,B). Myers et al. (2003) identified one demographically independent population (North Santiam River) in this subbasin. Historically accessible areas in the three uppermost watersheds of this subbasin are now blocked by Big Cliff and Detroit dams but may have been productive steelhead habitat (Parkhurst 1950). The CHART concluded that all of the occupied areas likely contain one or more PCEs for this ESU. Table L1 summarizes the total number of occupied reaches identified for each HUC5 watershed as containing spawning, rearing, or migration PCEs, as well as management activities that may affect the PCEs in the watersheds. Map L2 depicts the specific areas in this subbasin occupied by the ESU and under consideration for critical habitat designation.

After reviewing the best available scientific data for all of the areas within the freshwater and estuarine range of this ESU, the CHART concluded that the occupied HUC5 watersheds in this subbasin were of high conservation value to the ESU. Table L2 summarizes the CHART's PCE/watershed scores and conservation value ratings, and Figure L1 shows the overall distribution of ratings by HUC5 watershed. Among the key considerations identified in Table M2, the CHART noted that there are very few populations in this ESU and that the TRT has classified the North Santiam River steelhead as both a core population (historically abundant and "may offer the most likely path to recovery") as well as a genetic legacy population (one of the "the most intact representatives of the genetic character of the ESU") (McElhany et al. 2003). Similarly, ODFW considered the upper North Santiam River and Little North Santiam River as priority areas for steelhead, noting that these areas had high production potential and monitoring potential, but low habitat restoration potential (Oregon Plan for Salmon and Watersheds 2001). Also, occupied reaches in Little North Santiam HUC5 overlap with a FEMAT key watershed for at-risk anadromous salmonids (FEMAT 1994).

The CHART also considered whether the three inaccessible HUC5s (Upper North Santiam, North Fork Breitenbush River, and Detroit Reservoir/Blowout Divide Creek) may be essential to the conservation of this ESU but concluded that, in contrast to Willamette River spring Chinook, it is less certain whether these inaccessible HUC5s may be essential for the conservation of the Upper Willamette River steelhead ESU.

### **South Santiam River Subbasin (HUC4# 17090006)**

The South Santiam River subbasin is a Cascade Range drainage of the Upper Willamette River and contained in Linn County, Oregon. The subbasin contains eight watersheds, six of which are occupied by this ESU and encompass approximately 766 mi<sup>2</sup> and 860 miles of streams. Fish distribution and habitat use data from ODFW identify

approximately 230 miles of occupied riverine habitat in these watersheds (ODFW 2003A,B). Two watersheds in the upper Middle Santiam River (Quartzville Creek and Middle Santiam River) are blocked by Green Peter Dam. Myers et al. (2003) identified one demographically independent population (South Santiam River) in this subbasin. The CHART concluded that all of the occupied areas likely contain one or more PCEs for this ESU. Table L1 summarizes the total number of occupied reaches identified for each HUC5 watershed as containing spawning, rearing, or migration PCEs, as well as management activities that may affect the PCEs in the watersheds. Map L3 depicts the specific areas in this subbasin occupied by the ESU and under consideration for critical habitat designation.

After reviewing the best available scientific data for all of the areas within the freshwater and estuarine range of this ESU, the CHART concluded that the occupied HUC5 watersheds in this subbasin were of high conservation value to the ESU. Table L2 summarizes the CHART's PCE/watershed scores and conservation value ratings, and Figure M1 shows the overall distribution of ratings by HUC5 watershed. Among the key considerations identified in Table L2, the CHART noted that there are very few populations in this ESU and that the TRT has classified the South Santiam River steelhead as both a core population (historically abundant and "may offer the most likely path to recovery") as well as a genetic legacy population (one of the "the most intact representatives of the genetic character of the ESU") (McElhany et al. 2003). Similarly, ODFW considered the upper South Santiam River as a priority area for steelhead, noting that this area had high production potential and monitoring potential, and moderate habitat restoration potential (Oregon Plan for Salmon and Watersheds 2001). This assessment also noted that the Upper South Santiam "is at such low abundance that an extirpation warning is warranted" (Oregon Plan for Salmon and Watersheds 2001).

#### **Middle Willamette River Subbasin (HUC4# 17090007)**

The Middle Willamette River subbasin encompasses most of the valley floor reaches of the Willamette River upstream of Willamette Falls and is contained in the following Oregon counties: Clackamas, Marion, Polk, Yamhill, and Washington. The subbasin consists of four watersheds, all of which are occupied by this ESU and encompass approximately 712 mi<sup>2</sup> and 922 miles of streams. Fish distribution and habitat use data from ODFW identify approximately 177 miles of occupied riverine habitat (all rearing/migration) in these watersheds (ODFW 2003A,B). Myers et al. (2003) identified one demographically independent population (North Santiam River) that spawns in this subbasin, although three populations use this subbasin for rearing/migration. The CHART concluded that all of the occupied areas likely contain one or more PCEs for this

ESU. Table L1 summarizes the total number of occupied reaches identified for each HUC5 watershed as containing spawning, rearing, or migration PCEs, as well as management activities that may affect the PCEs in the watersheds. Map L4 depicts the specific areas in this subbasin occupied by the ESU and under consideration for critical habitat designation.

After reviewing the best available scientific data for all of the areas within the freshwater and estuarine range of this ESU, the CHART concluded that the occupied HUC5 watersheds in this subbasin were of low conservation value to the ESU. However, that assessment pertained solely to the tributary streams in these watersheds (e.g., Ash, Rickreall, and Harvey creeks), not the mainstem Willamette River nor the Mill Creek reaches connecting to the North Santiam River. The CHART concluded that all reaches of the Willamette River within this subbasin constitute a high value rearing and migration corridor. These high value reaches connect all populations and HUC5s in this ESU with downstream reaches and the ocean. Table L2 summarizes the CHART's PCE/watershed scores and conservation value ratings, and Figure L1 shows the overall distribution of ratings by HUC5 watershed.

#### **Yamhill River Subbasin (HUC4# 17090008)**

The Yamhill River subbasin is a Coast Range drainage of the middle Willamette River and is contained primarily in Polk, Tillamook, and Yamhill counties, Oregon (with very small and unoccupied portions in Lincoln and Washington counties as well). The subbasin contains seven watersheds, all of which are occupied by this ESU and encompass approximately 772 mi<sup>2</sup> and 966 miles of streams. Fish distribution and habitat use data from ODFW identify approximately 319 miles of occupied riverine habitat (all rearing/migration) in these watersheds (ODFW 2003A,B). Myers et al. (2003) did not identify a demographically independent population in this subbasin. These authors noted that there is considerable debate about the origin of naturally spawning winter-run steelhead currently found in several westside tributaries and went on to state that (with the exception of the Tualatin River) “there is little evidence to suggest that sustained spawning aggregations of steelhead may have existed historically in the westside tributaries of the Willamette River basin. Furthermore, it is unlikely that these tributaries, individually or collectively were large enough to constitute a DIP [demographically independent population].”

The CHART concluded that, despite uncertainties regarding the population status of steelhead in the watersheds in this subbasin, they likely contain one or more PCEs for this ESU. Table L1 summarizes the total number of occupied reaches identified for each HUC5 watershed as containing spawning, rearing, or migration reaches, as well as

management activities that may affect these reaches in the watersheds. Map L5 depicts the specific areas in this subbasin occupied by the ESU, but is unclear whether these areas qualify for consideration as critical habitat for this ESU. However, the CHART noted that, given the limited number of populations in this ESU, habitat in this subbasin may provide some conservation benefits to the ESU (e.g., as a buffer against a catastrophic event affecting Cascade watersheds). In that context, the CHART concluded that the Upper South Yamhill River HUC5 may have the highest potential conservation value in this subbasin and therefore assigned it a medium conservation value while habitat areas in the remaining six watersheds warrant a low conservation value to the ESU. Table L2 summarizes the CHART's watershed scores and conservation value ratings, and Figure L1 shows the overall distribution of ratings by HUC5 watershed.

### **Molalla/Pudding River Subbasin (HUC4# 17090009)**

The Molalla/Pudding River subbasin is an eastside drainage of the middle Willamette River and contained in Clackamas and Marion counties, Oregon. The subbasin contains six watersheds occupied by this ESU and encompasses approximately 875 mi<sup>2</sup> and 1,057 miles of streams. Fish distribution and habitat use data from ODFW identify approximately 284 miles of occupied riverine habitat in these watersheds (ODFW 2003A,B). The CHART concluded that all of the occupied areas likely contain one or more PCEs for this ESU. Table L1 summarizes the total number of occupied reaches identified for each HUC5 watershed as containing spawning, rearing, or migration PCEs, as well as management activities that may affect the PCEs in the watersheds. Map L6 depicts the specific areas in this subbasin occupied by the ESU and under consideration for critical habitat designation.

After reviewing the best available scientific data for all of the areas within the freshwater and estuarine range of this ESU, the CHART concluded that the occupied HUC5 watersheds in this subbasin ranged from high to low conservation value to the ESU. Of the six HUC5s reviewed, one was rated as having high (Upper Molalla River HUC5), two were rated as having medium and three were rated as having low conservation value. The CHART elevated the Abiqua Creek/Pudding River HUC5 from a Low to Medium conservation value, noting that recent data from a watershed assessment indicate that this HUC5 has some of the highest-quality habitat in the Pudding River subbasin (M. Simmons, NOAA Fisheries, pers. com). The CHART also made related changes based on this information and lowered the conservation values for two HUC5s (Butte Creek/Pudding River and Rock Creek Pudding River HUC5s) because the data indicate that the Abiqua Creek/Pudding River HUC5 has higher redd densities and more fish than these two HUC5s. Table L2 summarizes the CHART's PCE/watershed scores and



conservation value ratings, and Figure L1 shows the overall distribution of ratings by HUC5 watershed. Among the key considerations identified in Table L2, the CHART noted that ODFW considered the Molalla River as a priority area for steelhead, noting that this area had high production potential and monitoring potential, and moderate habitat restoration potential (Oregon Plan for Salmon and Watersheds 2001).

#### **Tualatin River Subbasin (HUC4# 17090010)**

The Tualatin River subbasin is a Coast Range drainage of the middle Willamette River and contained in Clackamas, Columbia, Multnomah, Tillamook, Washington, and Yamhill counties. The subbasin contains five watersheds, all of which are occupied by this ESU and encompass approximately 709 mi<sup>2</sup> and 889 miles of streams. Fish distribution and habitat use data from ODFW identify approximately 298 miles of occupied riverine habitat in these watersheds (ODFW 2003A,B). Myers et al. (2003) did not identify a demographically independent population in this subbasin. These authors noted that there is considerable debate about the origin of naturally spawning winter-run steelhead currently found in several westside tributaries and went on to state that (with the exception of the Tualatin River) “there is little evidence to suggest that sustained spawning aggregations of steelhead may have existed historically in the westside tributaries of the Willamette River basin. Furthermore, it is unlikely that these tributaries, individually or collectively were large enough to constitute a DIP [demographically independent population].”

The CHART concluded that, despite uncertainties regarding the population status of steelhead in the watersheds in this subbasin, they likely contain one or more PCEs for this ESU. Table L1 summarizes the total number of occupied reaches identified for each HUC5 watershed as containing spawning, rearing, or migration reaches, as well as management activities that may affect these reaches in the watersheds. Map L7 depicts the specific areas in this subbasin occupied by the ESU, but is unclear whether these areas qualify for consideration as critical habitat for this ESU. However, the CHART noted that, given the limited number of populations in this ESU, habitat in this subbasin may provide some conservation benefits to the ESU (e.g., as a buffer against a catastrophic event affecting Cascade watersheds). In that context, the CHART concluded that the Gales Creek HUC5 may have the highest potential conservation benefit in this subbasin and therefore assigned it a medium conservation value, while habitat areas in the remaining four watersheds warrant a low conservation value to the ESU. The CHART noted that Gales Creek was the one westside watershed with some evidence of possible historic use by steelhead (Parkhurst et al. 1950 as described in Myers et al.

2003). Table L2 summarizes the CHART's watershed scores and conservation value ratings, and Figure L1 shows the overall distribution of ratings by HUC5 watershed.

### **Lower Willamette/Columbia River Corridor**

The lower Willamette/Columbia River rearing and migration corridor consists of that segment from the confluence of the Willamette and Clackamas rivers to the Pacific Ocean. This corridor also includes the Multnomah Channel portion of the Lower Willamette River. Watersheds downstream of the Clackamas River subbasin (Johnson Creek and Columbia Slough/Willamette River HUC5s) are outside the spawning range of this ESU and likely used in a limited way as juvenile rearing habitat for this ESU. Fish distribution and habitat use data from ODFW identify approximately 138 miles of occupied riverine and estuarine habitat in this corridor (ODFW 2003a,b).

After reviewing the best available scientific data for all of the areas within the freshwater and estuarine range of this ESU, the CHART concluded that the lower Willamette/Columbia River corridor was of high conservation value to the ESU. The CHART noted that this corridor connects every watershed and population in this ESU with the ocean and is used by rearing/migrating juveniles and migrating adults. The Columbia River estuary is a particularly important area for this ESU as both juveniles and adults make the critical physiological transition between life in freshwater and marine habitats (ISAB 2000, Marriott et al. 2002).

### ***Marine Areas***

NOAA Fisheries' analysis focused on freshwater and estuarine habitats upstream of the mouth of the Columbia River. While marine areas are occupied by this ESU, within this vast area the agency has not identified "specific areas within the geographical area occupied by the species . . . on which are found those physical or biological features . . . essential to the conservation of the species."

### **Changes to the CHART's Initial Assessments**

The CHART reviewed the public and peer reviewer comments received on the Team's initial findings for this ESU as well as new information relevant to evaluating habitat areas for this ESU. As a result, the CHART changed conservation value ratings for three watersheds (all in the Molalla/Pudding subbasin) within the geographical area occupied by this ESU. There were no public comments or new information to indicate changes in the delineation of occupied habitat areas for this ESU. The proposed critical habitat designation (69 FR 74572, December 14, 2004) summarizes the comments and responses pertaining to the CHART's initial determinations for this ESU. And Tables L1 and L2

reflect the final CHART assessments, including the following changes in habitat area delineations:

<b>Subbasin</b>	<b>Watershed code</b>	<b>Watershed name</b>	<b>Changes from Initial CHART Assessment</b>
Molalla/ Pudding	1709000901	Abiqua Creek/ Pudding River	Changed conservation rating from Low to Medium.
Molalla/ Pudding	1709000902	Butte Creek/ Pudding River	Changed conservation rating from Medium to Low.
Molalla/ Pudding	1709000903	Rock Creek/ Pudding River	Changed conservation rating from Medium to Low.

### **References and Sources of Information**

References cited above as well as key reports and data sets reviewed by the CHART include the following:

- Bastasch, R., A. Bibao, and G. Sieglitz. 2002. Draft Willamette Subbasin Summary. Report Prepared for the Northwest Power Planning Council, dated May 17, 2002. (Available at: <http://www.cbfwa.org/>)
- Busby, P., T. Wainwright, G. Bryant, L. Lierheimer, R. Waples, F. Waknitz, and I. Lagomarsino. 1996. Status review of west coast steelhead from Washington, Idaho, Oregon and California. NOAA Tech. Memo NMFSNWFSC- 27, August 1996.
- Fulton, L. 1970. Spawning areas and abundance of steelhead trout and coho, sockeye, and chum salmon in the Columbia River basin – past and present. National Marine Fisheries Service Special Scientific Report – Fisheries No. 618, December 1970.
- Hulse, D., S. Gregory, and J. Baker (editors). 2002. Willamette River Basin Planning Atlas: Trajectories of Environmental and Ecological Change by the Pacific Northwest Ecosystem Research Consortium. Oregon State University Press.
- Independent Scientific Advisory Board (ISAB). 2000. The Columbia River Estuary and the Columbia River Basin Fish and Wildlife Program. Report of the ISAB dated November 28, 2000. (Available at: <http://www.nwcouncil.org/library/isab/isab2000-5.pdf>)

- Kostow, K. (editor). 1995. Biennial Report on the Status of Wild Fish in Oregon. OR. Dep. Fish Wildl. Rep., 217 p. + app. December 1995. (Available at: <http://www.dfw.state.or.us/>)
- Marriott, D., and 27 contributors. 2002. Lower Columbia River and Columbia River Estuary Subbasin Summary. Report Prepared for the Northwest Power Planning Council, dated May 17, 2002. (Available at: <http://www.cbfwa.org/>)
- Martin, J. 1998. Factors influencing production of Willamette River salmonids and recommendations for conservations actions. Corvallis, Oregon
- McElhany, P., T. Backman, C. Busack, S. Heppell, S. Kolmes, A. Maule, J. Myers, D. Rawding, D. Shively, and C. Steward. 2002. Willamette/Lower Columbia Pacific salmonid viability criteria. Draft report from the Willamette/Lower Columbia Technical Recovery Team. December 2002.
- Myers, J., C. Busack, D. Rawding, and A. Marshall. 2003. Historical population structure of Willamette and lower Columbia River basin Pacific salmonids. Willamette/Lower Columbia River Technical Recovery Team report. (October 2003). (Available at [http://www.nwfsc.noaa.gov/trt/popid\\_report.htm](http://www.nwfsc.noaa.gov/trt/popid_report.htm))
- NOAA Fisheries. 1999. Updated review of the status of the Upper Willamette River and Middle Columbia River ESUs of steelhead (*Oncorhynchus mykiss*). Report of the West Coast Steelhead Biological Review Team dated January 12, 1999.
- NOAA Fisheries. 2003. Preliminary conclusions regarding the updated status of listed ESUs of West Coast salmon and steelhead. Report of the West Coast Salmon Biological Review Team dated February 19, 2003.
- NMFS. 2005. Habitat Distribution for 12 Evolutionarily Significant Units of Pacific Salmon and Steelhead in Oregon, Washington, and Idaho. August 2005. GIS data available from:  
<http://www.nwr.noaa.gov/1salmon/salmesa/crithab/CHsite.htm>.
- Northwest Power Planning Council. 1990. Presence/absence database from Northwest Power Planning Council's subbasin planning process. (Available at [www.streamnet.org](http://www.streamnet.org))
- Olsen, E., P. Pierce, M. McLean, and K. Hatch. 1992. Stock Summary Reports for Columbia River Anadromous Salmonids, Volume I: Oregon Subbasins Below Bonneville Dam for the Coordinated Information System. Report to Bonneville Power Administration, Contract No. 1989BP94402, Project No. 198810800, 991 electronic pages (BPA Report DOE/BP-94402-1)

- Oregon Department of Fish and Wildlife (ODFW). 1990a. Coast Fork and Long Tom Rivers, Willamette River subbasin salmon and steelhead production plan. Columbia Basin System Planning, ODFW, Portland, Oregon.
- Oregon Department of Fish and Wildlife (ODFW). 1990b. Coast Range, Willamette River subbasin salmon and steelhead production plan. Columbia Basin System Planning, ODFW, Portland, Oregon.
- Oregon Department of Fish and Wildlife (ODFW). 1990c. McKenzie River subbasin salmon and steelhead production plan. Columbia Basin System Planning, ODFW, Portland, Oregon.
- Oregon Department of Fish and Wildlife (ODFW). 1990d. Middle Fork Willamette River, Willamette River subbasin salmon and steelhead production plan. Columbia Basin System Planning, ODFW, Portland, Oregon.
- Oregon Department of Fish and Wildlife (ODFW). 1990e. Santiam and Calapooia Rivers, Willamette River subbasin salmon and steelhead production plan. Columbia Basin System Planning, ODFW, Portland, Oregon.
- Oregon Department of Fish and Wildlife (ODFW). 1990f. Willamette mainstem, Willamette River subbasin salmon and steelhead production plan. Columbia Basin System Planning, ODFW, Portland, Oregon.
- Oregon Department of Fish and Wildlife (ODFW). 1992. Clackamas River subbasin fish management plan. Portland, Oregon.
- Oregon Department of Fish and Wildlife. 2003a. Oregon Salmon and Steelhead Habitat Distribution. Natural Resources Information Management Program. (Available at: <http://rainbow.dfw.state.or.us/nrimp/>)
- Oregon Department of Fish and Wildlife. 2003b. Oregon Salmon and Steelhead Habitat Distribution at 1:24,000 Scale. Natural Resources Information Management Program. (Available at: <http://rainbow.dfw.state.or.us/nrimp/>)
- Oregon Plan for Salmon and Watersheds. 1998. Revision of the steelhead supplement dated February 6, 1998. (Available at <http://www.oregon-plan.org/archives>)
- Parkhurst, Z.E., F.G. Bryant, and R.S. Nielson. 1950. Survey of the Columbia River and its tributaries. Part 3. USFWS Special Scientific Report–Fisheries, No. 36, 103 p.
- Pearson, C. 2003. Compilation and summary of watershed analyses and assessments conducted in the upper Willamette River. Database available from NOAA Fisheries, Protected Resources Division, Portland, Oregon.

**Table M1.** Summary of Occupied Areas, PCEs, and Management Activities Affecting PCEs for the Upper Willamette River Steelhead ESU

Map Code	Subbasin	Watershed	Area/ Watershed (HUC5) Code	Primary Constituent Elements (PCEs)			Unoccupied but may be essential (mi)**	Management Activities***
				Spawning/ Rearing PCEs (mi)	Rearing/ Migration PCEs (mi)	Migration/ Presence PCEs (mi)*		
	Upper Willamette	Calapooia River	1709000303	56.3	16.4	0		A, F, R, U
	Upper Willamette	Oak Creek	1709000304	0	34.4	0		A, R, U
	Upper Willamette	Luckiamute River	1709000306	31.5	102	0		A
	North Santiam	Upper North Santiam River	1709000501	0	0	0	<sup>a</sup>	
	North Santiam	North Fork Breitenbush River	1709000502	0	0	0	14.9 <sup>a</sup>	
	North Santiam	Detroit Reservoir/ Blow Out Divide Creek	1709000503	0	0	0	10.5 <sup>a</sup>	
	North Santiam	Middle North Santiam River	1709000504	27.9	0	0		A, D, F, R
	North Santiam	Little North Santiam River	1709000505	27.9	0	0		A, F, M
	North Santiam	Lower North Santiam River	1709000506	43.6	37.3	0		A, D, F, I, S, U
	South Santiam	Hamilton Creek/South Santiam River	1709000601	27.5	30.5	5.4		A, C, D, F, I, R, U
	South Santiam	Crabtree Creek	1709000602	37.7	8.8	0		A, C, F, R
	South Santiam	Thomas Creek	1709000603	19.4	22.7	0		A, D, F, R
	South Santiam	Quartzville Creek	1709000604	0	0	0	34 <sup>b</sup>	
	South Santiam	Middle Santiam River	1709000605	0	0	0	14.4 <sup>b</sup>	
	South Santiam	South Santiam River	1709000606	32.9	0.3	0		D, F
	South Santiam	South Santiam River / Foster Reservoir	1709000607	11.7	8	0		D, F
	South Santiam	Wiley Creek	1709000608	22.9	1.9	0		F
	Middle Willamette	Mill Creek/Willamette River	1709000701	21.2	10.5	0		A, C, I, R, U
	Middle Willamette	Rickreall Creek	1709000702	11.6	49.2	0		A, R, U
	Middle Willamette	Willamette River/Chehalem Creek	1709000703	3	60.8	0		A, C, R, U, W
	Middle Willamette	Abernethy Creek	1709000704	0	20.4	0		A, C, R, U, W
	Yamhill	Upper South Yamhill River	1709000801	40.2	36.8	0		A, F
	Yamhill	Willamina Creek	1709000802	22.5	11	0		A, F

Map Code	Subbasin	Watershed	Area/ Watershed (HUC5) Code	Primary Constituent Elements (PCEs)			Unoccupied but may be essential (mi)**	Management Activities***
				Spawning/ Rearing PCEs (mi)	Rearing/ Migration PCEs (mi)	Migration/ Presence PCEs (mi)*		
	Yamhill	Mill Creek/South Yamhill River	1709000803	5.3	13.2	0		A
	Yamhill	Lower South Yamhill River	1709000804	3.1	46.1	0		A, C, R, U
	Yamhill	Salt Creek/South Yamhill River	1709000805	0	9.3	0		A
	Yamhill	North Yamhill River	1709000806	34.7	54.1	0		A, U
	Yamhill	Yamhill River	1709000807	0	43	0		A, R, U
	Molalla/ Pudding	Abiqua Creek/Pudding River	1709000901	35.2	22.5	0		A, F, R
	Molalla/ Pudding	Butte Creek/Pudding River	1709000902	17.3	34.5	0		A, F, R
	Molalla/ Pudding	Rock Creek/Pudding River	1709000903	6.4	0	0		A, I, R
	Molalla/ Pudding	Senecal Creek/Mill Creek	1709000904	0	29.5	0		A, U
	Molalla/ Pudding	Upper Molalla River	1709000905	72.9	0	0		A, F, R
	Molalla/ Pudding	Lower Molalla River	1709000906	17.2	48.5	0		A, C, F, R, U
	Tualatin	Dairy Creek	1709001001	50.6	57.8	0		A, C, F, R, U
	Tualatin	Gales Creek	1709001002	39.3	15.2	0		A, C, F, R, U
	Tualatin	Scoggins Creek	1709001003	20.3	5.4	0.7		A, C, D, F, R, U
	Tualatin	Rock Creek/Tualatin River	1709001004	23.1	13.7	21		A, C, R, U
	Tualatin	Lower Tualatin River	1709001005	13.1	8.9	28.8		A, C, R, U
	Lower Willamette	Johnson Creek	1709001201	0	6.3	0		A, C, I, R, U, W
	Lower Willamette	Scappoose Creek	1709001202	0	21.7	0		A, C, F, I, R, U, W
	Lower Willamette	Columbia Slough/ Willamette River	1709001203	0	18.5	0		A, C, R, U, W
	Multiple	Lower Columbia Corridor (Sandy/Washougal to Ocean)	NA	0	0	98.2 <sup>c</sup>		C, D, I, R, T, U, W

<sup>a</sup> Big Cliff and Detroit dams are a barrier to fish distribution in this watershed. Unoccupied habitat areas above these dams may be essential to conservation.

<sup>b</sup> Green Peter Dam is a barrier to fish distribution in this watershed. Unoccupied habitat areas above these dams may be essential to conservation.

<sup>c</sup> The Lower Columbia River from the ocean upstream approximately 46.5 miles is considered to contain estuarine PCEs, in addition to migration and rearing (ISAB 2000).

\* Some streams classified as “Migration/Presence PCEs” may also include rearing or spawning PCEs, but the GIS data are still undergoing review to confirm additional habitat use types.

\*\* These watersheds historically supported spawning and rearing PCEs. The CHART determined that these watersheds may be essential for conservation of the ESU. Since these watersheds are unoccupied, the CHART did not identify management activities.

\*\* This list is not exhaustive. It is intended to highlight key management activities affecting PCEs in each watershed. Activities identified are based on the general categories described by Spence et al. (1996) and summarized previously in the “Special Management Considerations or Protection” section of this report. Coding is as follows: F= forestry, G = grazing, A = agriculture, C = channel modifications/diking, R = road building/maintenance, U = urbanization, S = sand and gravel mining, M = mineral mining, D = dams, I = irrigation impoundments and withdrawals, T = river, estuary, and ocean traffic, W = wetland loss/removal, B = beaver removal, X = exotic/invasive species introductions, H = forage fish/species harvest. Primary sources for this information were the CHART and reports by Bastasch et al. (2003), Hulse et al. (2002), Pearson (2003), ODFW (1990a-f, 1992), and land use/land cover GIS layers from the U.S. Geological Survey.



**Table L2.** Summary of Initial CHART Scores and Ratings of Conservation Value for Habitat Areas in HUC5 Watersheds Occupied by the Upper Willamette River Steelhead ESU

Map Code	Subbasin	Area/ Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)					Total HUC5 Score (0-15) <sup>3</sup>	Comments/ Other Considerations	CHART Rating of HUC5 Conservation Value
				1	2	3	4	5			
	Upper Willamette	Calapooia River	1709000303	3	1	1	1	3	9	Moderate HUC5 score; HUC5 contains all spawning PCEs for one of only four demographically independent populations in this ESU	High
	Upper Willamette	Oak Creek	1709000304	3	1	1	1	2	8	Moderate HUC5 score; CHART concluded that tributaries are low value relative to other HUC5s, but rearing/migration PCEs in Willamette corridor are highly essential for upstream HUC5s (Calapooia River population)	Medium
	Upper Willamette	Luckiamute River	1709000306	3	1	1	1	2	8	Not identified as supporting a historically independent population; relatively widespread habitat may make this HUC5 potentially more important than other westside HUC5s in this subbasin	Medium
	North Santiam	Upper North Santiam River	1709000501						*	<u>Unoccupied HUC5</u> , but population expansion into this HUC5 possibly essential for conservation; Big Cliff and Detroit dams are a barrier to fish distribution in this watershed; High HUC5 score	Possibly High

<sup>3</sup> PCE/watershed scores were derived using the CHART scoring process described in the introduction to this report. The CHART employed an earlier 5-factor version of the scoring matrix for three ESUs (Columbia River chum salmon and Upper Willamette River chinook salmon and steelhead) therefore the maximum possible score for these ESUs was 15 points.

Map Code	Subbasin	Area/ Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)					Total HUC5 Score (0-15) <sup>3</sup>	Comments/ Other Considerations	CHART Rating of HUC5 Conservation Value
				1	2	3	4	5			
	North Santiam	North Fork Breitenbush River	1709000502						*	Unoccupied HUC5, but population expansion into this HUC5 possibly essential for conservation; Big Cliff and Detroit dams are a barrier to fish distribution in this watershed; High HUC5 score	Possibly High
	North Santiam	Detroit Reservoir/ Blow Out Divide Creek	1709000503						*	Unoccupied HUC5, but population expansion into this HUC5 possibly essential for conservation; Big Cliff and Detroit dams are a barrier to fish distribution in this watershed; High HUC5 score	Possibly High
	North Santiam	Middle North Santiam River	1709000504	3	1	1	2	2	9	Moderate HUC5 score; PCEs support a TRT core and legacy population and ODFW considers North Santiam as priority area for steelhead	High
	North Santiam	Little North Santiam River	1709000505	3	2	3	2	2	12	High HUC5 score; PCEs support a TRT core and legacy population and ODFW considers North Santiam as priority area for steelhead; PCEs are in a FEMAT key watershed	High
	North Santiam	Lower North Santiam River	1709000506	3	1	1	2	2	9	Moderate HUC5 score; PCEs support a TRT core and legacy population and ODFW considers North Santiam as priority area for steelhead; high value connectivity reaches for upstream HUC5s	High
	South Santiam	Hamilton Creek/South Santiam River	1709000601	3	1	1	2	2	9	Moderate HUC5 score; PCEs support a TRT core and legacy population; high value connectivity reaches for all HUC5s in this subbasin	High
	South Santiam	Crabtree Creek	1709000602	3	1	1	2	2	9	Moderate HUC5 score; PCEs support a TRT core and legacy population	High

Map Code	Subbasin	Area/ Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)					Total HUC5 Score (0-15) <sup>3</sup>	Comments/ Other Considerations	CHART Rating of HUC5 Conservation Value
				1	2	3	4	5			
	South Santiam	Thomas Creek	1709000603	3	1	1	2	2	9	Moderate HUC5 score; PCEs support a TRT core and legacy population	High
	South Santiam	Quartzville Creek	1709000604						*	<u>Unoccupied HUC5</u> , but population expansion into this HUC5 possibly essential for conservation; Green Peter Dam is a barrier to fish distribution in this watershed; High HUC5 score	Possibly High
	South Santiam	Middle Santiam River	1709000605						*	<u>Unoccupied HUC5</u> , but population expansion into this HUC5 possibly essential for conservation; Green Peter Dam is a barrier to fish distribution in this watershed; High HUC5 score	Possibly High
	South Santiam	South Santiam River	1709000606	3	2	3	2	2	12	High HUC5 score; PCEs support a TRT core and legacy population and ODFW considers upper South Santiam as priority area for steelhead	High
	South Santiam	South Santiam River / Foster Reservoir	1709000607	3	2	2	2	2	11	High HUC5 score; PCEs support a TRT core and legacy population and ODFW considers upper South Santiam as priority area for steelhead	High
	South Santiam	Wiley Creek	1709000608	3	1	1	2	2	9	Moderate HUC5 score; PCEs support a TRT core and legacy population	High
	Middle Willamette	Mill Creek/ Willamette River	1709000701	1	1	1	0	2	5	Low HUC5 score; spawning PCEs may support one TRT population (North Santiam River); primary importance of this HUC5 is as connectivity corridor for upstream HUC5s in North Santiam subbasin	Low
	Middle Willamette	Rickreall Creek	1709000702	2	1	1	1	2	7	Low-moderate HUC5 score; PCEs in Willamette corridor are highly essential and support three TRT populations	Low

Map Code	Subbasin	Area/ Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)					Total HUC5 Score (0-15) <sup>3</sup>	Comments/ Other Considerations	CHART Rating of HUC5 Conservation Value
				1	2	3	4	5			
	Middle Willamette	Willamette River/ Chehalem Creek	1709000703	3	1	1	1	2	8	Moderate HUC5 score; no spawning PCEs in HUC5 and CHART concluded that tributaries are low value, but the Willamette corridor is highly essential	Low
	Middle Willamette	Abernethy Creek	1709000704	2	1	1	1	2	7	Low-moderate HUC5 score; no spawning PCEs in HUC5 and CHART concluded that tributaries are low value, but the Willamette corridor is highly essential	Low
	Yamhill	Upper South Yamhill River	1709000801	3	2	1	1	2	9	Not identified as supporting a historically independent population; relatively widespread habitat may make this HUC5 potentially more important than other westside HUC5s in this subbasin	Medium
	Yamhill	Willamina Creek	1709000802	3	1	1	1	2	8	Not identified as supporting a demographically independent population	Low
	Yamhill	Mill Creek/South Yamhill River	1709000803	2	1	1	1	2	7	Not identified as supporting a demographically independent population	Low
	Yamhill	Lower South Yamhill River	1709000804	2	1	1	1	2	7	Not identified as supporting a demographically independent population	Low
	Yamhill	Salt Creek/South Yamhill River	1709000805	1	1	1	0	1	4	Not identified as supporting a demographically independent population	Low
	Yamhill	North Yamhill River	1709000806	3	1	1	1	2	8	Not identified as supporting a demographically independent population	Low
	Yamhill	Yamhill River	1709000807	3	1	1	1	2	8	Not identified as supporting a demographically independent population	Low

Map Code	Subbasin	Area/ Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)					Total HUC5 Score (0-15) <sup>3</sup>	Comments/ Other Considerations	CHART Rating of HUC5 Conservation Value
				1	2	3	4	5			
	Molalla/Pudding	Abiqua Creek/ Pudding River	1709000901	3	1	1	1	2	8	Moderate HUC5 score; PCEs support a TRT demographically independent population and ODFW considers Mollala River as priority area for steelhead; CHART elevated this HUC5 from a Low to Medium coconservation value, noting that recent data from a watershed assessment indicate that this HUC5 has the highest-quality spawning and rearing habitat, the highest redd densities, and the largest winter steelhead run in the Pudding River subbasin.	Medium
	Molalla/Pudding	Butte Creek/ Pudding River	1709000902	3	1	1	1	2	8	Moderate HUC5 score; PCEs support a TRT demographically independent population and ODFW considers Mollala River as priority area for steelhead. CHART reduced this HUC5 from a Medium to Low coconservation value, noting that recent data from a watershed assessment indicate that this HUC5 is likely lower in conservation value than the nearby Abiqua Creek HUC5.	Low
	Molalla/Pudding	Rock Creek/ Pudding River	1709000903	3	1	1	1	2	8	Moderate HUC5 score; PCEs support a TRT demographically independent population and ODFW considers Mollala River as priority area for steelhead. CHART reduced this HUC5 from a Medium to Low coconservation value, noting that recent data from a watershed assessment indicate that this HUC5 is likely lower in conservation value than the nearby Abiqua Creek HUC5.	Low

Map Code	Subbasin	Area/ Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)					Total HUC5 Score (0-15) <sup>3</sup>	Comments/ Other Considerations	CHART Rating of HUC5 Conservation Value
				1	2	3	4	5			
	Molalla/Pudding	Senecal Creek/ Mill Creek	1709000904	3	1	1	1	2	8	Moderate HUC5 score; PCEs support a TRT demographically independent population and ODFW considers Mollala River as priority area for steelhead; no spawning PCEs and limited tributary habitat; CHART determined that this HUC5 had relatively lower PCE quality and quantity than others supporting this population; connectivity reaches are of medium value to Rock Creek/Pudding River and Butte Creek/Pudding River HUC5s upstream	Low
	Molalla/Pudding	Upper Molalla River	1709000905	3	2	1	1	2	9	Moderate HUC5 score; PCEs support a TRT demographically independent population and ODFW considers Mollala River as priority area for steelhead; CHART considered that this HUC5 likely has best PCE quality of all supporting this population	High
	Molalla/Pudding	Lower Molalla River	1709000906	3	1	1	1	2	8	Moderate HUC5 score; PCEs support a TRT demographically independent population and ODFW considers Mollala River as priority area for steelhead	Medium
	Tualatin	Dairy Creek	1709001001	3	1	1	1	2	8	Not identified as supporting a demographically independent population	Low
	Tualatin	Gales Creek	1709001002	3	2	1	1	2	9	Not identified as supporting a historically independent population; relatively widespread habitat may make this HUC5 potentially more important than other westside HUC5s in this subbasin	Medium
	Tualatin	Scoggins Creek	1709001003	2	1	1	1	2	7	Not identified as supporting a demographically independent population	Low

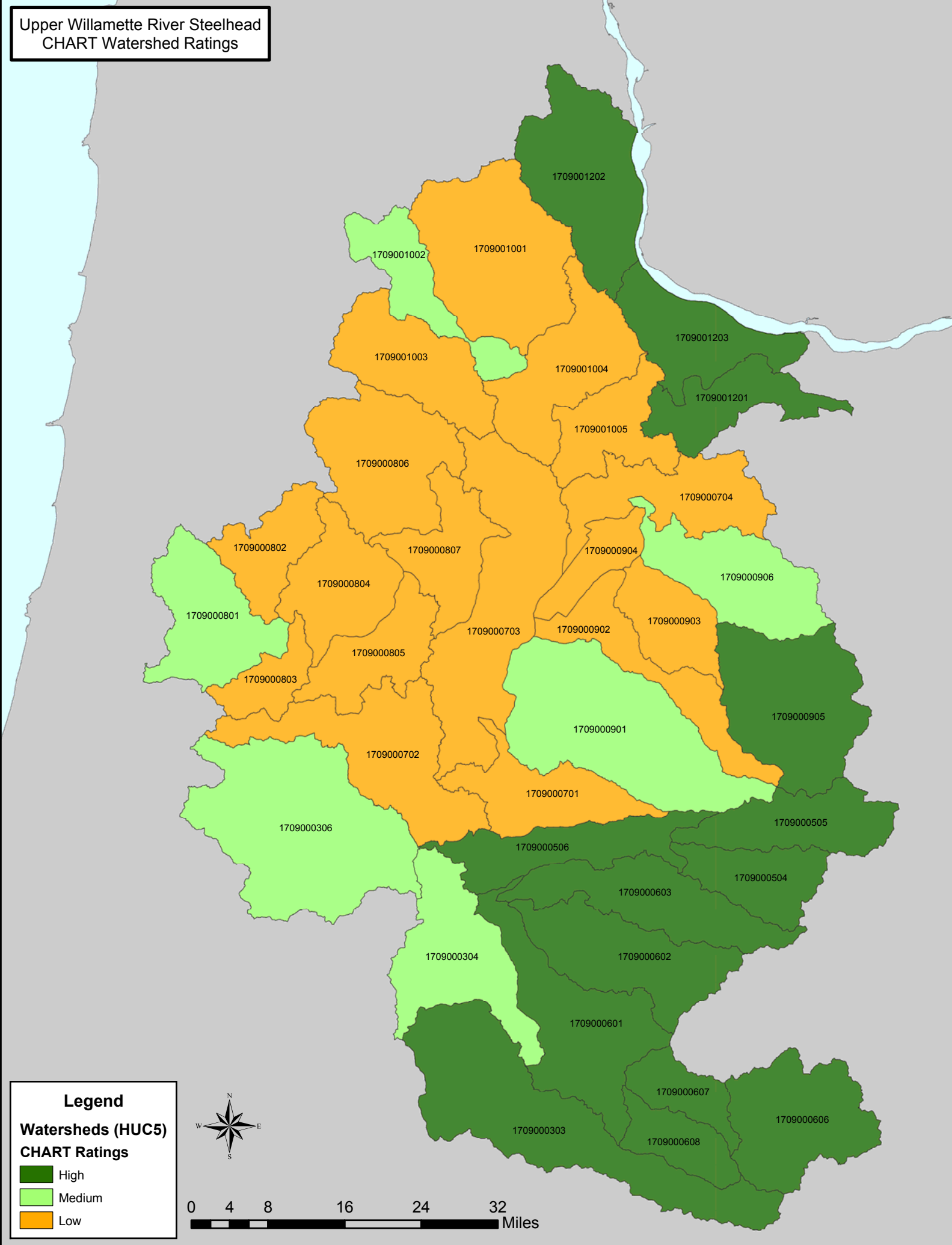
Map Code	Subbasin	Area/ Watershed	Area/ Watershed (HUC5) Code	Scoring System (factors)					Total HUC5 Score (0-15) <sup>3</sup>	Comments/ Other Considerations	CHART Rating of HUC5 Conservation Value
				1	2	3	4	5			
	Tualatin	Rock Creek/ Tualatin River	1709001004	2	1	1	1	2	7	Not identified as supporting a demographically independent population	Low
	Tualatin	Lower Tualatin River	1709001005	2	1	1	1	2	7	Not identified as supporting a demographically independent population	Low
	Lower Willamette	Johnson Creek	1709001201						NS	HUC5 not scored since it is part of the migration corridor. The CHART concluded that rearing and migration PCEs throughout this corridor are highly essential to ESU conservation.	High
	Lower Willamette	Scappoose Creek	1709001202						NS	HUC5 not scored since it is part of the migration corridor. The CHART concluded that rearing and migration PCEs throughout this corridor are highly essential to ESU conservation.	High
	Lower Willamette	Columbia Slough/Willamette River	1709001203						NS	HUC5 not scored since it is part of the migration corridor. The CHART concluded that rearing and migration PCEs throughout this corridor are highly essential to ESU conservation.	High
	Multiple	Lower Willamette/Columbia River Corridor	NA						NS	Area not scored since many reaches are outside HUC5 boundaries. However, The CHART concluded that rearing and migration PCEs throughout this corridor are highly essential to ESU conservation	High

\* Indicates that HUC5 contains blocked/inaccessible areas that the CHART concluded may be essential for ESU conservation.

**Figure L1.** CHART Ratings of Conservation Value for Habitat Areas in HUC5 Watersheds Occupied by the Upper Willamette River Steelhead ESU



Upper Willamette River Steelhead  
CHART Watershed Ratings



**Legend**

**Watersheds (HUC5)**

**CHART Ratings**

- High
- Medium
- Low

0 4 8 16 24 32 Miles

# Upper Willamette Winter Steelhead Distribution Upper Willamette Sub-basin (17090003)



Map L1



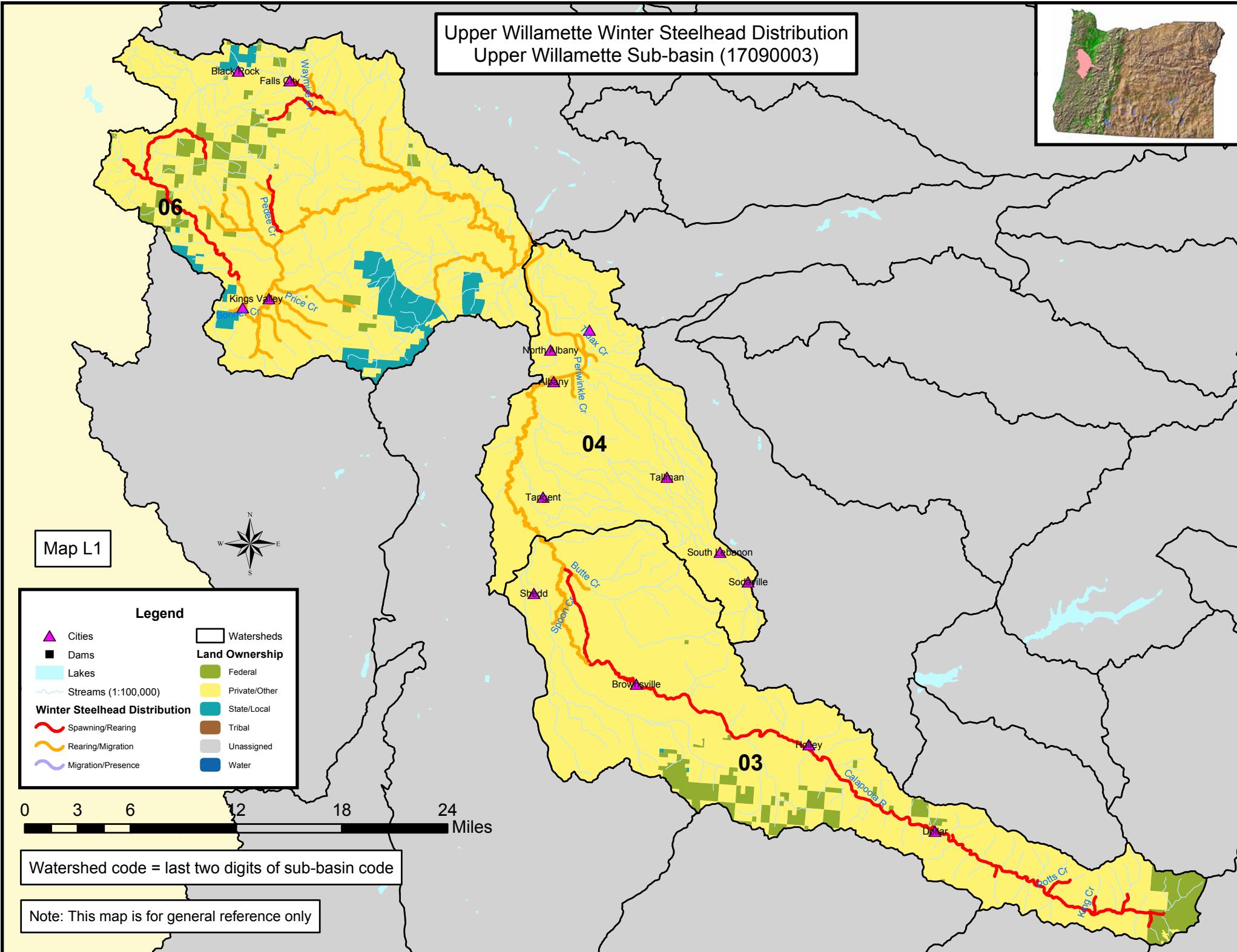
## Legend

- |                                      |                       |
|--------------------------------------|-----------------------|
| ▲ Cities                             | ▭ Watersheds          |
| ■ Dams                               | <b>Land Ownership</b> |
| ■ Lakes                              | ■ Federal             |
| ~ Streams (1:100,000)                | ■ Private/Other       |
| <b>Winter Steelhead Distribution</b> | ■ State/Local         |
| — Spawning/Rearing                   | ■ Tribal              |
| — Rearing/Migration                  | ■ Unassigned          |
| — Migration/Presence                 | ■ Water               |

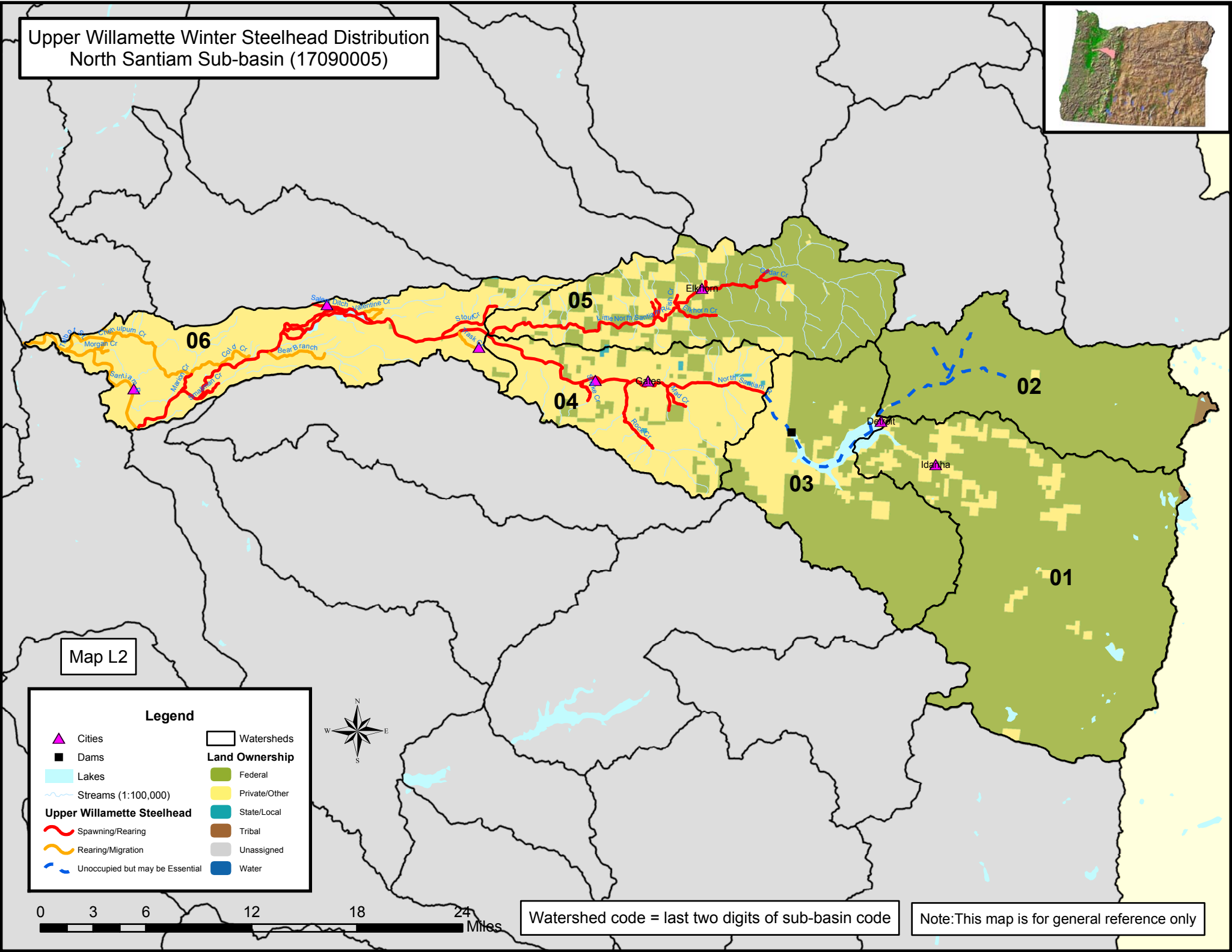
0 3 6 12 18 24 Miles

Watershed code = last two digits of sub-basin code

Note: This map is for general reference only



# Upper Willamette Winter Steelhead Distribution North Santiam Sub-basin (17090005)



Map L2

**Legend**

- Cities
- Dams
- Lakes
- Streams (1:100,000)
- Upper Willamette Steelhead Spawning/Rearing
- Upper Willamette Steelhead Rearing/Migration
- Unoccupied but may be Essential

**Land Ownership**

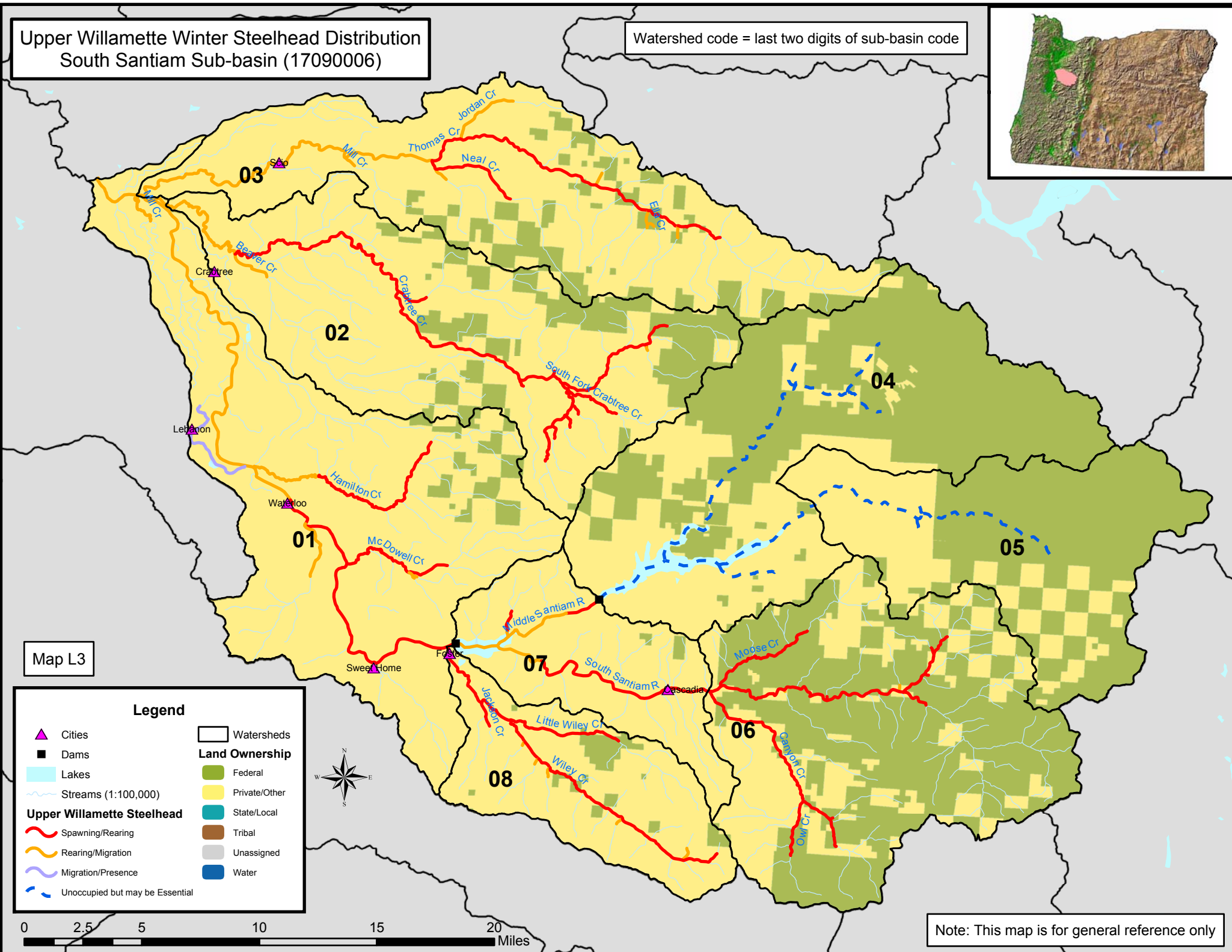
- Federal
- Private/Other
- State/Local
- Tribal
- Unassigned
- Water

Watershed code = last two digits of sub-basin code

Note: This map is for general reference only

# Upper Willamette Winter Steelhead Distribution South Santiam Sub-basin (17090006)

Watershed code = last two digits of sub-basin code



Map L3

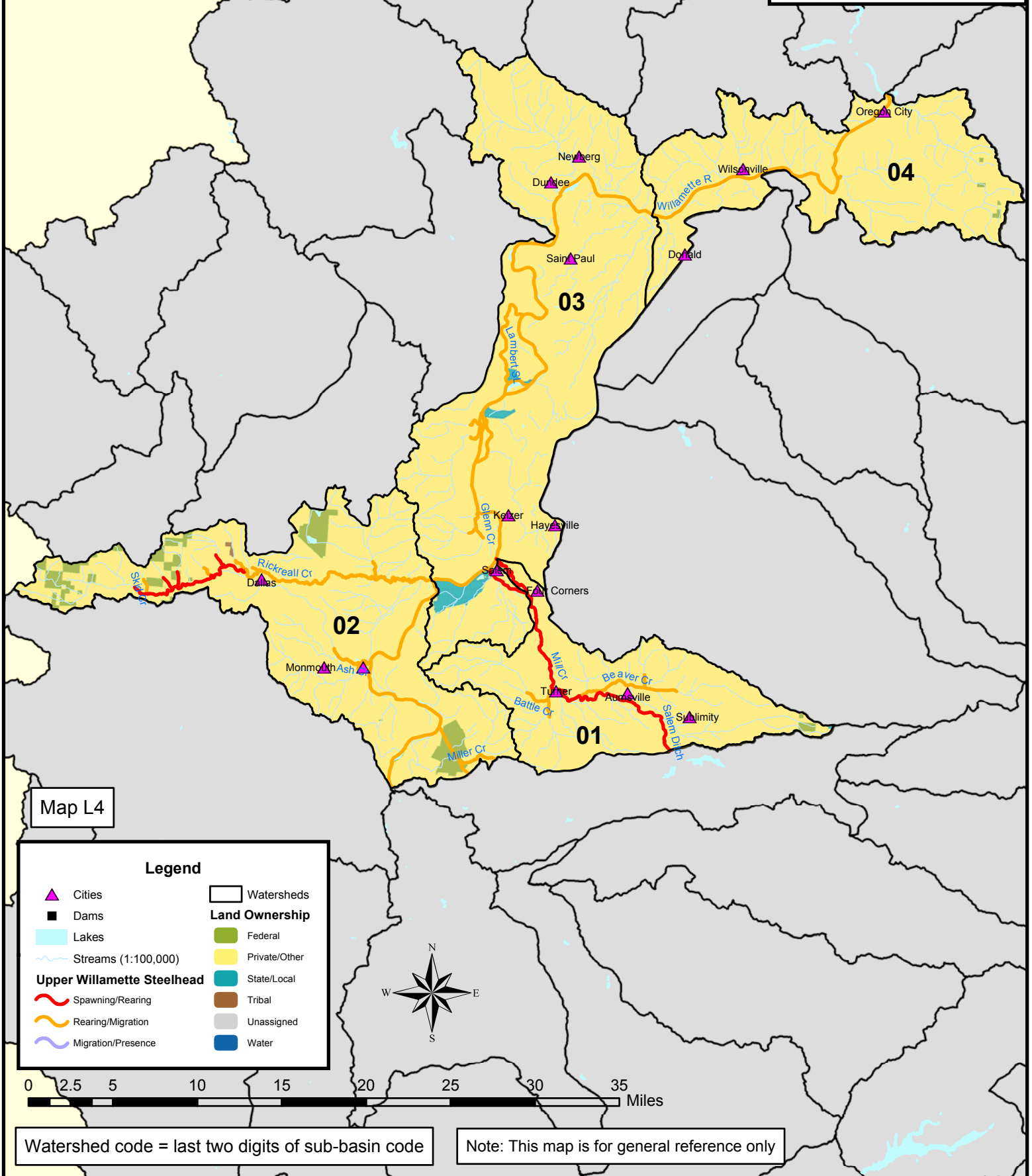
## Legend

- Cities
- Dams
- Lakes
- Streams (1:100,000)
- Spawning/Rearing
- Rearing/Migration
- Migration/Presence
- Unoccupied but may be Essential
- Watersheds
- Land Ownership**
  - Federal
  - Private/Other
  - State/Local
  - Tribal
  - Unassigned
  - Water

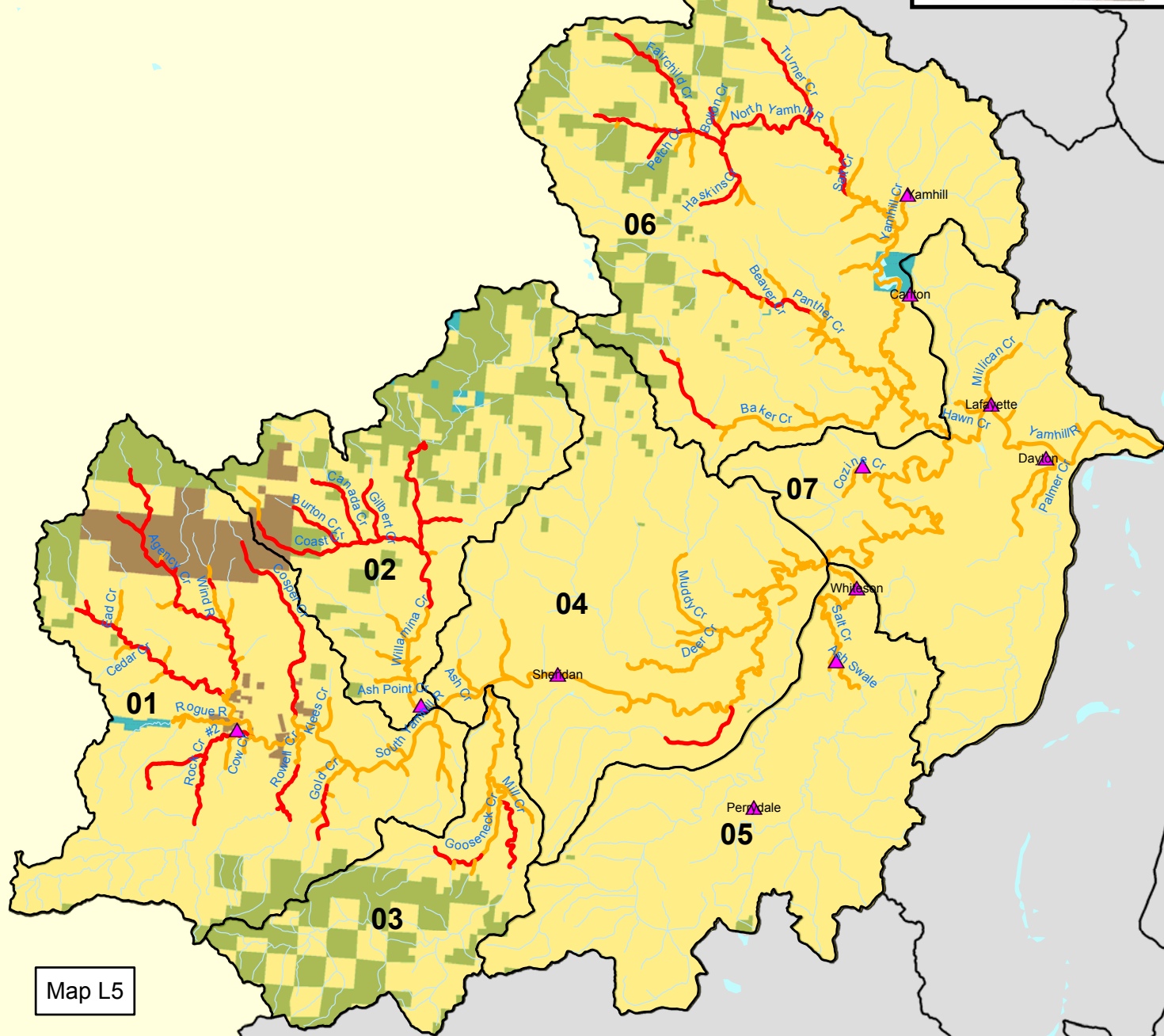
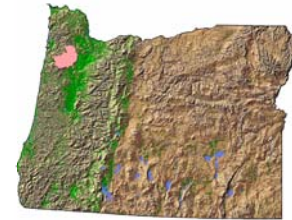
Note: This map is for general reference only



Upper Willamette Winter Steelhead Distribution  
Middle Willamette Distribution (17090007)



# Upper Willamette Winter Steelhead Distribution Yamhill Sub-basin (17090008)



Map L5

## Legend

- |                                      |                       |
|--------------------------------------|-----------------------|
| Cities                               | Watersheds            |
| Dams                                 | <b>Land Ownership</b> |
| Lakes                                | Federal               |
| Streams (1:100,000)                  | Private/Other         |
| <b>Winter Steelhead Distribution</b> | State/Local           |
| Spawning/Rearing                     | Tribal                |
| Rearing/Migration                    | Unassigned            |
| Migration/Presence                   | Water                 |

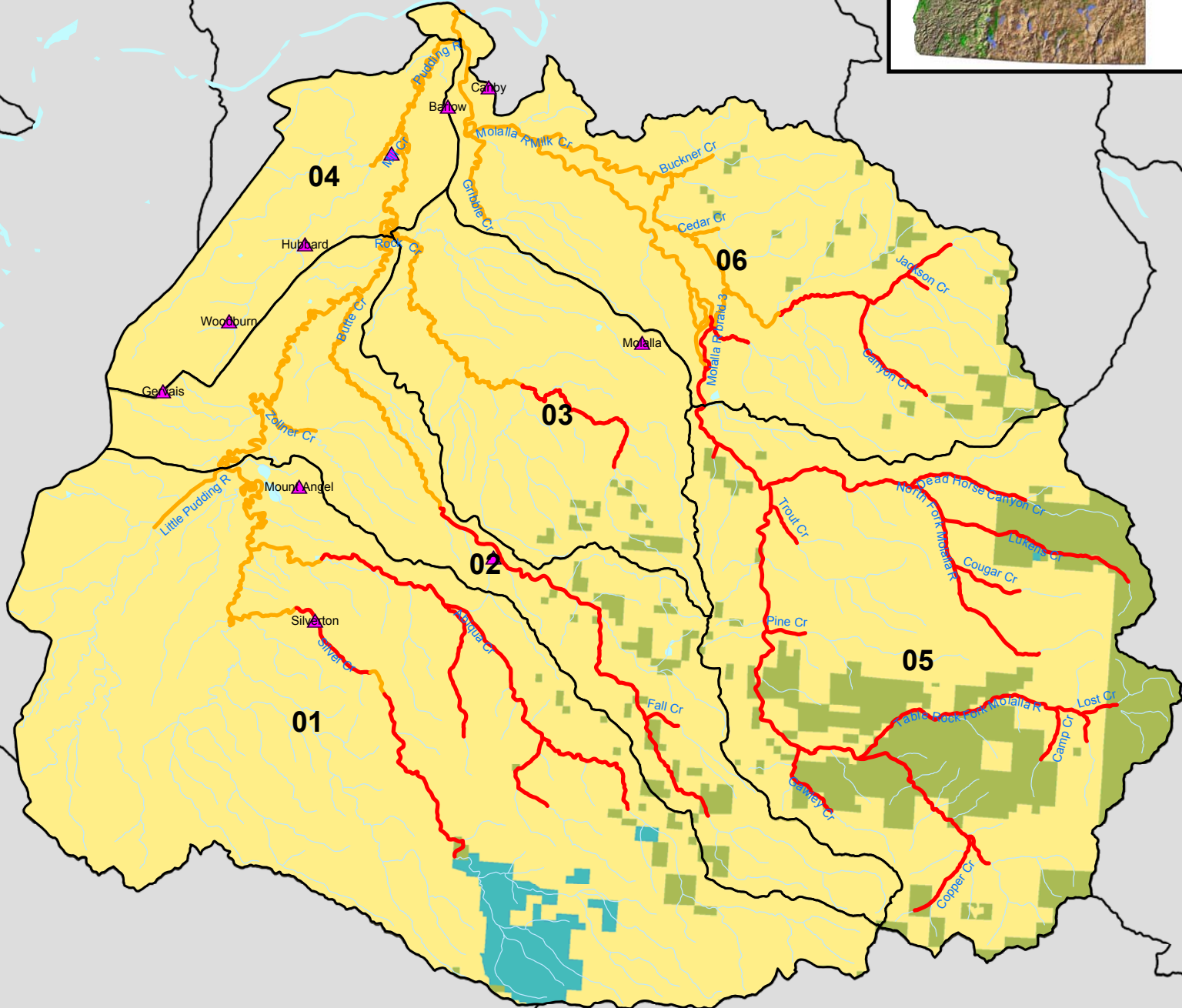


0 2.5 5 10 15 20 Miles

Note: This map is for general reference only

Watershed code = last two digits of sub-basin code

# Upper Willamette Winter Steelhead Distribution Molalla/Pudding Sub-basin (17090009)



Map L6

## Legend

- |                                   |               |                       |
|-----------------------------------|---------------|-----------------------|
| Cities                            | Dams          | Watersheds            |
| Lakes                             | Federal       | <b>Land Ownership</b> |
| Streams (1:100,000)               | Private/Other | State/Local           |
| <b>Upper Willamette Steelhead</b> | Tribal        | Unassigned            |
| Spawning/Rearing                  | Water         |                       |
| Rearing/Migration                 |               |                       |
| Migration/Presence                |               |                       |



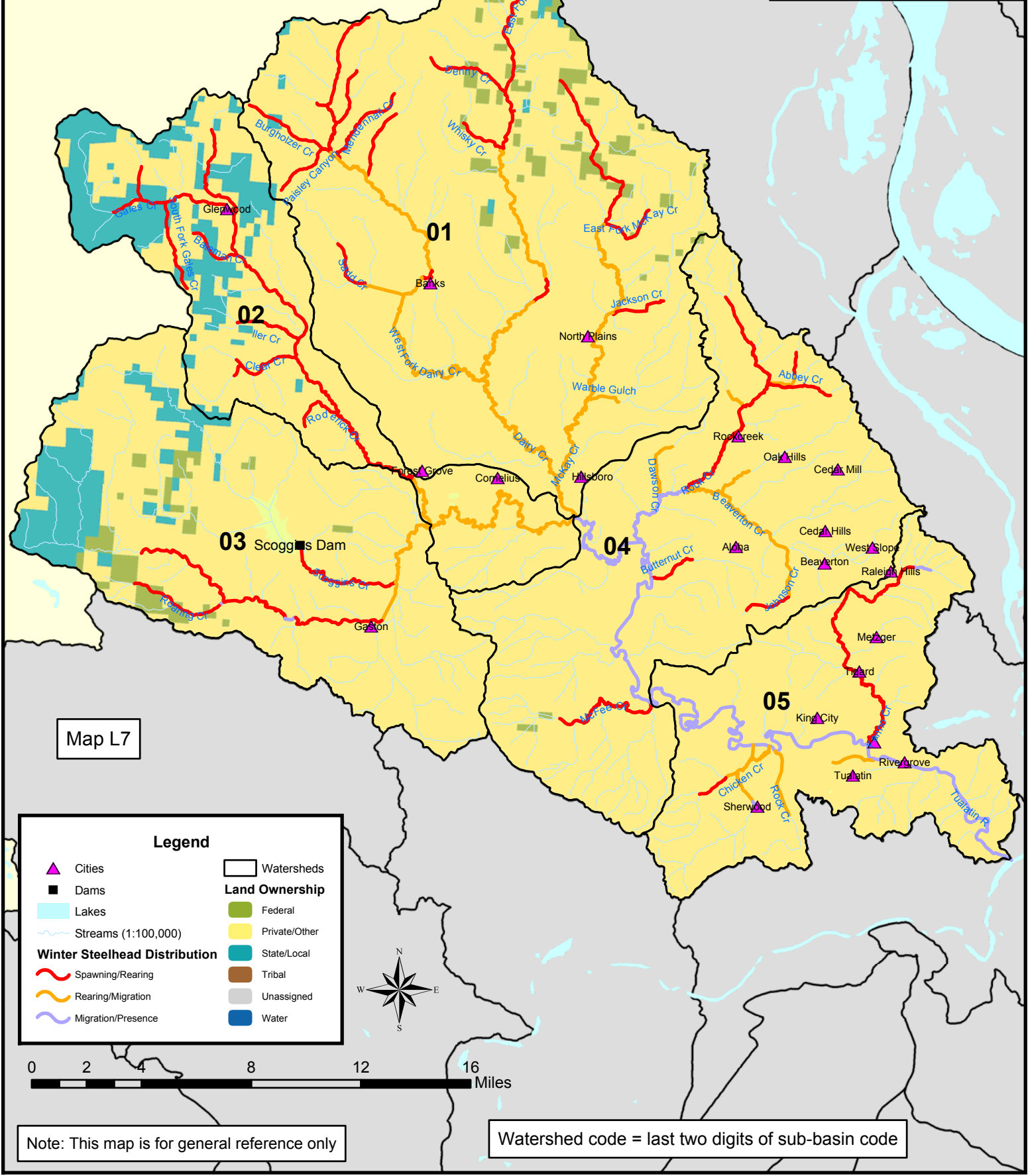
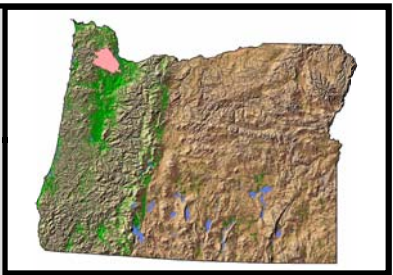
Watershed code = last two digits of sub-basin code

Note: This map is for general reference only

0 2 4 8 12 16 Miles



# Upper Willamette Winter Steelhead Distribution Tualatin Sub-basin (17090010)



Map L7

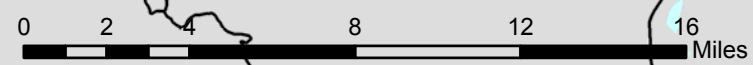
**Legend**

- Cities
- Dams
- Lakes
- Streams (1:100,000)
- Winter Steelhead Distribution**
  - Spawning/Rearing
  - Rearing/Migration
  - Migration/Presence

**Land Ownership**

- Federal
- Private/Other
- State/Local
- Tribal
- Unassigned
- Water

**Watersheds**



Note: This map is for general reference only

Watershed code = last two digits of sub-basin code



## Appendix M. CHART Conclusions Regarding Areas Under Consideration for Exclusion from Critical Habitat

The CHARTs considered whether excluding from critical habitat designation particular areas with certain economic impacts would significantly impede conservation. The CHARTs considered these areas both alone or in combination with other eligible areas. In making this determination, the CHARTs considered such factors as the role the particular area plays in the conservation of the population(s), the uniqueness or importance to the population(s), any recovery planning emphasis on the area, and similar considerations. The CHARTs' final conclusions, summarized in the table below, were obtained via discussions with each CHART during meetings conducted in the Spring of 2005.

			Conservation Value Rating			
ESU	Watershed Name	Watershed Code	Benefit of designating watershed	Benefit of designating connectivity corridor	Would Exclusion Significantly Impede Conservation?	Comments
Puget Sound Chinook Salmon	Bellingham Bay	1711000201	L		No	Based on exclusion of entire watershed.
	Samish River	1711000202	L		No	Based on exclusion of entire watershed.
	Birch Bay	1711000204	L		No	Based on exclusion of entire watershed.
	Baker River	1711000508	M		No	Based on exclusion of entire watershed.
	Lake Sammamish	1711001202	M		No	Based on exclusion of entire watershed.
	Sammamish River	1711001204	M	M	No	Based on exclusion of entire watershed.
	Upper Green River	1711001301	M		Yes	CHART concluded that excluding this watershed would significantly impede conservation, noting the significant restoration efforts being made here by the Muckleshoot Tribe and others.
	Prairie	1711001601	L		No	Based on exclusion of entire watershed.
	Prairie	1711001602	L	L	No	Based on exclusion of entire watershed.

			Conservation Value Rating			
ESU	Watershed Name	Watershed Code	Benefit of designating watershed	Benefit of designating connectivity corridor	Would Exclusion Significantly Impede Conservation?	Comments
	Lower West Hood Canal Frontal	1711001802	L		No	Based on exclusion of entire watershed.
	Big Quilcene River	1711001806	L		No	Based on exclusion of entire watershed.
	West Kitsap	1711001808	L		No	Based on exclusion of entire watershed.
	Kennedy/Goldsborough	1711001900	L		No	Based on exclusion of entire watershed.
	Puget	1711001901	L		No	Based on exclusion of entire watershed.
	Prairie	1711001902	L		No	Based on exclusion of entire watershed.
	Puget Sound/East Passage	1711001904	L		No	Based on exclusion of entire watershed.
	Port Angeles Harbor	1711002004	M		No	Based on exclusion of entire watershed.
	Lake Washington	1711001203	M	H	No	Based on exclusion of tributaries only.
Lower Columbia River Chinook Salmon	Little White Salmon River	1707010510	M		No	Based on exclusion of entire watershed.
	Washougal River	1708000106	M		Yes	CHART concluded that excluding this watershed would significantly impede conservation, noting that the Lower Columbia Fish Recovery Board's interim recovery plan emphasizes achieving a high viability level for Washougal River fall chinook.
	Salmon Creek	1708000109	L		No	Based on exclusion of entire watershed.
	Kalama River	1708000301	M		Yes	CHART concluded that excluding this watershed would significantly impede conservation, noting that the Kalama River is important because it supports both fall- and spring-run fish, represents a substantial amount of the remaining spring-run habitat for this ESU, and is emphasized in the Lower Columbia River Fish Recovery Board's interim recovery plan.

			Conservation Value Rating			
ESU	Watershed Name	Watershed Code	Benefit of designating watershed	Benefit of designating connectivity corridor	Would Exclusion Significantly Impede Conservation?	Comments
	Beaver Creek/Columbia River	1708000302	L		No	Based on exclusion of entire watershed.
	Germany/Abernathy	1708000304	M		No	Based on exclusion of entire watershed.
	Tilton River	1708000501	M		No	Based on exclusion of entire watershed.
	Youngs River	1708000601	M		No	Based on exclusion of entire watershed.
	Abernathy Creek	1709000704	L		No	Based on exclusion of entire watershed.
	Eagle Creek	1709001105	L		No	Based on exclusion of entire watershed.
	Middle Columbia/Grays Creek	1707010512	M	H	No	Based on exclusion of tributaries only.
	North Fork Toutle River	1708000504	M	H	No	Based on exclusion of tributaries only.
	Johnson Creek	1709001201	M	H	Yes	CHART concluded that excluding this watershed would significantly impede conservation, citing comments by City of Portland and noting that this watershed provides important refuge habitat for Clackamas River chinook as well as unique habitat conditions (especially year-round thermal conditions) that promote adaptations and ESU diversity in an urbanized watershed.
Upper	Salmon Creek	1709000104	M		No	Based on exclusion of entire watershed.
Willamette River	Row River	1709000201	L	L	No	Based on exclusion of entire watershed.
Chinook Salmon	Mosby Creek	1709000202	L		No	Based on exclusion of entire watershed.
	Upper Coast Fork Willamette River	1709000203	L		No	Based on exclusion of entire watershed.

			Conservation Value Rating			
ESU	Watershed Name	Watershed Code	Benefit of designating watershed	Benefit of designating connectivity corridor	Would Exclusion Significantly Impede Conservation?	Comments
	Lower Coast Fork Willamette River	1709000205	L	L	No	Based on exclusion of entire watershed.
	Long Tom River	1709000301	L		No	Based on exclusion of entire watershed.
	Marys River	1709000305	M		Yes	CHART concluded that exclusion would significantly impede conservation, noting that the Mary's provides extensive rearing habitat (especially for overwintering) that is critical for maintaining and restoring ESU life history diversity.
	Blue River	1709000404	M		No	Based on exclusion of entire watershed.
	Mohawk River	1709000406	M		No	Based on exclusion of entire watershed.
	Lower South Yamhill River	1709000804	L		No	Based on exclusion of entire watershed.
	Salt Creek/South Yamhill River	1709000805	L		No	Based on exclusion of entire watershed.
	North Yamhill River	1709000806	L		No	Based on exclusion of entire watershed.
	Yamhill River	1709000807	L	L	No	Based on exclusion of entire watershed.
	Abiqua Creek/Pudding River	1709000901	M		No	Based on exclusion of entire watershed.
	Rock Creek/Pudding River	1709000903	L		No	Based on exclusion of entire watershed.
	Eagle Creek	1709001105	L		No	Based on exclusion of entire watershed.

			Conservation Value Rating			
ESU	Watershed Name	Watershed Code	Benefit of designating watershed	Benefit of designating connectivity corridor	Would Exclusion Significantly Impede Conservation?	Comments
	Hills Creek Reservoir	1709000105	M	H	Yes	CHART concluded that exclusion would significantly impede conservation, noting that this watershed supports a local-origin, core population which may have been the largest in the entire subbasin. The primary reason this watershed was not assigned a High conservation value rating is due to reservoir inundation.
	Middle Fork Willamette/Lookout Point	1709000107	M	H	Yes	CHART concluded that exclusion would significantly impede conservation, noting that this watershed supports a local-origin, core population which may have been the largest in the entire subbasin. Lost Creek represents the only unregulated stream with chinook spawning in this area. The primary reason this watershed was not assigned a High conservation value rating is due to reservoir inundation.
	Muddy Creek	1709000302	L	H	No	Based on exclusion of tributaries only.
	Oak Creek	1709000304	L	H	No	Based on exclusion of tributaries only.
	Mill Creek/Willamette River	1709000701	L	H	No	Based on exclusion of tributaries only.
	Rickreall Creek	1709000702	L	H	No	Based on exclusion of tributaries only.
	Willamette River/Chehalem Creek	1709000703	L	H	No	Based on exclusion of tributaries only.
	Abernethy Creek	1709000704	L	H	No	Based on exclusion of tributaries only.
	Butte Creek/Pudding River	1709000902	L	M	No	Based on exclusion of tributaries only.
	Senecal Creek/Mill Creek	1709000904	L	M	No	Based on exclusion of tributaries only.

			Conservation Value Rating			
ESU	Watershed Name	Watershed Code	Benefit of designating watershed	Benefit of designating connectivity corridor	Would Exclusion Significantly Impede Conservation?	Comments
Upper Columbia River Spring-run Chinook Salmon	Middle Methow River	1702000806	M	H	Yes	CHART concluded that exclusion would significantly impede conservation, noting that spawning has been observed in this watershed once flows were restored to Wolf Creek. The lower reaches of Wolf Creek, Beaver Creek, and other tributaries in this watershed also provide important winter juvenile rearing habitat.
	Lower Methow River	1702000807	M	H	No	Based on exclusion of tributaries only.
	Lake Entiat	1702001002	M	H	No	Based on exclusion of tributaries only.
	Icicle/Chumstick	1702001104	M	H	No	Based on exclusion of tributaries only.
	Lower Wenatchee River	1702001105	M	H	No	Based on exclusion of tributaries only.
Hood Canal Summer-run Chum Salmon	Skokomish River	1711001701	M		Yes	CHART concluded that exclusion would significantly impede conservation, noting that the watershed has long term stability (e.g., lack of development as well as drought and flood protection from dam) that reinforce the TRT's ecological diversity and spatial diversity parameters.
	Upper West Hood Canal Frontal	1711001807	M		Yes	CHART concluded that exclusion would significantly impede conservation given that fish in the Little Quilcene River are part of a larger, essential population in this ESU.
Columbia River	North Fork Toutle River	1708000504	M	M	No	Based on exclusion of entire watershed.
Chum Salmon	Green River	1708000505	M		No	Based on exclusion of entire watershed.
Ozette Lake Sockeye Salmon	No areas considered for exclusion.					

			Conservation Value Rating			
ESU	Watershed Name	Watershed Code	Benefit of designating watershed	Benefit of designating connectivity corridor	Would Exclusion Significantly Impede Conservation?	Comments
Upper Columbia River Steelhead	Foster Creek	1702000503	L		No	Based on exclusion of entire watershed.
	Lower Chelan	1702000903	M		No	Based on exclusion of entire watershed.
	RattleSnake Creek	1702001204	L		No	Based on exclusion of entire watershed.
	Lower Crab Creek	1702001509	M		Yes	CHART concluded that exclusion would significantly impede conservation, noting that this watershed contains 24 miles of spawning habitat with significant potential use for conservation and recovery. Steelhead in this area may also exhibit life-history traits uniquely adapted to high temperatures.
	Upper Okanogan River	1702000601	M	H	Yes	CHART concluded that exclusion would significantly impede conservation, noting that steelhead cannot rely on habitat in the mainstem Okanogan year-round due to degraded conditions. These degraded conditions make tributary habitats especially important to support juvenile rearing. This area of the Okanogan also provides important tributary rearing habitat for juveniles from all upstream areas.

			Conservation Value Rating			
ESU	Watershed Name	Watershed Code	Benefit of designating watershed	Benefit of designating connectivity corridor	Would Exclusion Significantly Impede Conservation?	Comments
	Okanogan River/Bonaparte Creek	1702000602	M	H	Yes	CHART concluded that exclusion would significantly impede conservation, noting that steelhead cannot rely on habitat in the mainstem Okanogan year-round due to degraded conditions. These degraded conditions make tributary habitats especially important to support juvenile rearing. This area of the Okanogan provides important tributary rearing habitat for juveniles from all upstream areas.
	Lower Okanogan River	1702000605	M	H	Yes	CHART concluded that exclusion would significantly impede conservation, noting that the limited remaining tributary habitats (e.g., Loup Loup Creek) are crucial for this population especially in light of deteriorated mainstem conditions.
	Lake Entiat	1702001002	M	H	No	Based on exclusion of tributaries only.
	Icicle/Chumstick	1702001104	M	H	Yes	CHART concluded that exclusion would significantly impede conservation, noting that Icicle Creek has good steelhead spawning habitat in the headwaters and is an important focus of current recovery efforts.
Snake River	Flat Creek	1706010704	L		No	Based on exclusion of entire watershed.
Steelhead	Pataha Creek	1706010705	L		No	Based on exclusion of entire watershed.
	Lower Palouse River	1706010808	L		No	Based on exclusion of entire watershed.
	Road Creek	1706020107	L		No	Based on exclusion of entire watershed.



			Conservation Value Rating			
ESU	Watershed Name	Watershed Code	Benefit of designating watershed	Benefit of designating connectivity corridor	Would Exclusion Significantly Impede Conservation?	Comments
	Squaw Creek	1706020128	M		Yes	CHART concluded that exclusion would significantly impede conservation, noting that Squaw Creek is a very large stream with a good amount of steelhead habitat and is very important for thermal refugia. The Thompson Creek mine that caused much of the habitat degradation is in remediation.
	Pahsimeroi River/Falls Creek	1706020202	M	M	No	Based on exclusion of entire watershed.
	Napias Creek	1706020319	M		No	Based on exclusion of entire watershed.
	Agency Creek	1706020404	M		No	Based on exclusion of entire watershed.
	Big Mallard Creek	1706020707	L		No	Based on exclusion of entire watershed.
	Rice Creek	1706020917	M		No	Based on exclusion of entire watershed.
	Little Salmon River/Hard Creek	1706021002	M	M	Yes	CHART concluded that exclusion would significantly impede conservation, noting that habitat is limiting in the Little Salmon River and this watershed maintains connectivity of rearing and migration habitats for both upstream and downstream watersheds and is a major source of cold water for the Little Salmon River basin.
	Three Mile Creek	1706030512	L		No	Based on exclusion of entire watershed.
	Upper Orofino Creek	1706030613	L		No	Based on exclusion of entire watershed.
	Jim Ford Creek	1706030614	M		Yes	CHART concluded that exclusion would significantly impede conservation, noting good habitat quality and that substantial restoration activities are underway here (e.g., by Nez Perce Tribe).

			Conservation Value Rating			
ESU	Watershed Name	Watershed Code	Benefit of designating watershed	Benefit of designating connectivity corridor	Would Exclusion Significantly Impede Conservation?	Comments
	Upper Sweetwater Creek	1706030630	M		Yes	CHART concluded that exclusion would significantly impede conservation, noting that Sweetwater Creek provides the best spawning and rearing habitat in Lapwai Creek for A-run steelhead. Also, Lapwai Creek is one of the few remaining watersheds still producing A-run steelhead.
	Salmon River/Slate Creek	1706020113	M	H	Yes	CHART concluded that exclusion would significantly impede conservation, noting that Thompson Creek is a very large stream with a good amount of steelhead habitat. The mine that caused much of the habitat degradation is in remediation. Slate Creek is also a large stream and very important as a thermal refugium.
	Yankee Fork/Jordan Creek	1706020125	M	H	Yes	CHART concluded that exclusion would significantly impede conservation, noting that, notwithstanding considerable past degradation from mining (e.g., the Hecla-Grouse Creek Mine in upper Jordan Creek is in remediation), the Yankee Fork supports good steelhead production and there are several miles of rearing habitat. Tributaries provide important thermal refugia and the area is also the site of numerous restoration efforts by the Shoshone-Bannock Tribes.

			Conservation Value Rating			
ESU	Watershed Name	Watershed Code	Benefit of designating watershed	Benefit of designating connectivity corridor	Would Exclusion Significantly Impede Conservation?	Comments
	Panther Creek/Trail Creek	1706020322	M	H	Yes	CHART concluded that exclusion would significantly impede conservation, noting relatively extensive tributary habitat for this population and substantial restoration activities underway (e.g., streamside incubators established in two tributaries).
	South Fork Clearwater River/Peasley Creek	1706030503	L	H	No	Based on exclusion of tributaries only.
	Lower Clearwater River	1706030601	L	H	No	Based on exclusion of tributaries only.
Middle Columbia River Steelhead	Pine Creek	1707010209	L		No	Based on exclusion of entire watershed.
	Wildhorse Creek	1707010304	L		No	Based on exclusion of entire watershed.
	Stage Gulch	1707010308	L		No	Based on exclusion of entire watershed.
	Lower Butter Creek	1707010310	L		No	Based on exclusion of entire watershed.
	White Salmon River	1707010509	M		Yes	CHART concluded that exclusion would significantly impede conservation, noting that the White Salmon River is an important focus of restoration efforts.
	Little White Salmon River	1707010510	M		No	Based on exclusion of entire watershed.
	White River	1707030610	L		No	Based on exclusion of entire watershed.
	Mud Springs Creek	1707030704	L		No	Based on exclusion of entire watershed.
						CHART concluded that exclusion would significantly impede conservation, noting that the tributaries in this watershed provide important thermal refugia for juveniles.
	Yakima River/Spring Creek	1703000306	M	H	Yes	

			Conservation Value Rating			
ESU	Watershed Name	Watershed Code	Benefit of designating watershed	Benefit of designating connectivity corridor	Would Exclusion Significantly Impede Conservation?	Comments
	Cottonwood Creek	1707010208	M	H	Yes	CHART concluded that exclusion would significantly impede conservation, noting that tributaries in this watershed contain important rearing and migration habitat for upstream areas (e.g., Yellowjacket Creek) and active restoration efforts are ongoing.
	Lower Walla Walla River	1707010211	M	H	No	Based on exclusion of tributaries only.
	Middle Columbia/Grays Creek	1707010512	M	H	No	Based on exclusion of tributaries only.
	Lower John Day River/Clarno	1707020405	L	H	No	Based on exclusion of tributaries only.
Lower Columbia River Steelhead	Bull Run River	1708000105	M		No	Based on exclusion of entire watershed.
	Salmon Creek	1708000109	M		No	Based on exclusion of entire watershed.
	Tilton River	1708000501	M		No	Based on exclusion of entire watershed.
	Abernethy Creek	1709000704	L		No	Based on exclusion of entire watershed.
	Middle Columbia/Grays Creek	1707010512	L	H	No	Based on exclusion of tributaries only.
	Columbia Gorge Tributaries	1708000107	M	H	Yes	CHART concluded that excluding this watershed would significantly impede conservation, noting that the Lower Columbia Fish Recovery Board's interim recovery plan emphasizes achieving a high viability level for lower Gorge tributaries.

			Conservation Value Rating			
ESU	Watershed Name	Watershed Code	Benefit of designating watershed	Benefit of designating connectivity corridor	Would Exclusion Significantly Impede Conservation?	Comments
	North Fork Toutle River	1708000504	M	H	Yes	CHART concluded that exclusion would significantly impede conservation, noting that this is one of only two watersheds supporting a TRT core winter-run population.
Upper Willamette River Steelhead	Luckiamute River	1709000306	M		Yes	CHART concluded that exclusion would significantly impede conservation, noting that the relatively widespread habitat in the Luckiamute River may help buffer extinction risks should a catastrophic event harm the Cascade (eastside) tributary populations.
	Willamina Creek	1709000802	L		No	Based on exclusion of entire watershed.
	Mill Creek/South Yamhill River	1709000803	L		No	Based on exclusion of entire watershed.
	Lower South Yamhill River	1709000804	L	M	No	Based on exclusion of tributaries only.
	Salt Creek/South Yamhill River	1709000805	L		No	Based on exclusion of entire watershed.
	North Yamhill River	1709000806	L		No	Based on exclusion of entire watershed.
	Abiqua Creek/Pudding River	1709000901	M		Yes	CHART concluded that exclusion would significantly impede conservation, noting that a recent watershed assessment underscores that this watershed contains the largest steelhead run and best spawning and rearing habitat in the Pudding River subbasin.
	Rock Creek/Pudding River	1709000903	L		No	Based on exclusion of entire watershed.
	Dairy Creek	1709001001	L		No	Based on exclusion of entire watershed.
	Scoggins Creek	1709001003	L		No	Based on exclusion of entire watershed.

			Conservation Value Rating			
ESU	Watershed Name	Watershed Code	Benefit of designating watershed	Benefit of designating connectivity corridor	Would Exclusion Significantly Impede Conservation?	Comments
	Rock Creek/Tualatin River	1709001004	L	M	No	Based on exclusion of entire watershed.
	Lower Tualatin River	1709001005	L	M	No	Based on exclusion of entire watershed.
	Mill Creek/Willamette River	1709000701	L	H	No	Based on exclusion of tributaries only.
	Rickreall Creek	1709000702	L	H	No	Based on exclusion of tributaries only.
	Willamette River/Chehalem Creek	1709000703	L	H	No	Based on exclusion of tributaries only.
	Abernethy Creek	1709000704	L	H	No	Based on exclusion of tributaries only.
	Yamhill River	1709000807	L	M	No	Based on exclusion of tributaries only.
	Butte Creek/Pudding River	1709000902	L	M	No	Based on exclusion of tributaries only.
	Senecal Creek/Mill Creek	1709000904	L	M	No	Based on exclusion of tributaries only.

## **Appendix N. CHART Conclusions Regarding ESA Section 7 Leverage**

The following table identifies, for each ESU, those watersheds that met the following “low leverage” profile identified by NOAA Fisheries habitat biologists:

- less than 25 percent of the land area in federal ownership
- no hydropower dams, and
- no consultations likely to occur on instream work.

We chose these attributes because federal lands, dams and instream work all have a high likelihood of consultation and activities undergoing consultation have a potential to significantly affect the physical and biological features of salmon and steelhead habitat. Where federal lands are involved any activity occurring there must undergo a section 7 consultation if it may affect the species or the designated critical habitat. Salmon and steelhead habitat can be significantly affected by many activities occurring on federal lands, including grazing, timber harvest, roadbuilding, and mining (see, e.g., 2004 NFP BiOp). Dams generally are either federally operated or federally permitted by the U.S. Army Corps of Engineers or by the Federal Energy Regulatory Commission, triggering section 7 consultation. Dam operation can significantly affect salmon and steelhead in many ways, including by impeding passage, inundating habitat and changing flow and temperature regimes. Instream work generally requires a permit from the Corps. Instream work can significantly affect salmon and steelhead habitat in a number of ways, including by reducing channel complexity, increasing flows, diminishing connectivity between the stream channel and floodplain, and increasing sediment. Other types of activities also impact salmon and steelhead habitat, but their potential leverage was not deemed as predictable as those used in the above low leverage profile.

In addition to watersheds matching this profile, the CHARTs also reviewed all watersheds identified as low conservation value, but not exceeding an \$85,000 economic threshold, to determine if they were low leverage and should be considered for exclusion. Data used to query these parameters were the same as those reported in NOAA Fisheries’ final economic analysis (NMFS, 2005a). The table below also includes the CHART’s assessment as to whether the watershed was in fact likely to be “low leverage,” and the CHART’s conclusion as to whether excluding a “low leverage” watershed would significantly impede the conservation of the ESU.

These findings were obtained via discussions with each CHART during final meetings conducted in the Spring of 2005. The CHARTs' conclusions were subsequently used in the agency's final ESA 4(b)(2) analysis (NMFS, 2005b).

### ***References***

NMFS, 2005a. Final Economic Analysis of Critical Habitat Designation for 12 West Coast Salmon and Steelhead ESUs. NOAA Fisheries Northwest Fisheries Science Center Processed Report. August 2005. (Available from NOAA Fisheries at <http://www.nwr.noaa.gov/1salmon/salmesa/crithab/CHsite.htm>)

NMFS, 2005b. Designation of Critical Habitat for West Coast Salmon and Steelhead: Final 4(b)(2) Report. NOAA Fisheries Northwest Region Report. August 2005. (Available from NOAA Fisheries at <http://www.nwr.noaa.gov/1salmon/salmesa/crithab/CHsite.htm>)



ESU	Watershed Name	Watershed Code	Conservation Value Rating		Likely to be Low Leverage?	Comments
			Benefit of designating watershed	Benefit of designating connectivity corridor		
Puget Sound Chinook Salmon			No watersheds matched the profile for low leverage.			
Lower Columbia River Chinook Salmon	Beaver Creek/Columbia River	1708000302	Low		No	CHART noted that consultations were likely to yield significant leverage in this HUC5, and also noted several recent Corps of Engineers consultations here.
	Green River	1708000505	High		No	CHART noted that consultations were likely to yield significant leverage in this HUC5, noting the species’ spawning habitat overlap with Federal lands in the upper watershed.
	South Fork Toutle River	1708000506	High		No	CHART noted that consultations were likely to yield significant leverage in this HUC5, noting the species’ spawning habitat overlap with Federal lands in the upper watershed.
Upper Willamette River Chinook Salmon	Little Fall Creek	1709000108	Medium		No	CHART noted that consultations were likely to yield significant leverage in this HUC5, noting the species’ spawning habitat overlap with Federal lands in the upper watershed.
	Mohawk River	1709000406	Medium		Yes	CHART concluded that this was a low leverage HUC5 and that exclusion would not significantly impede conservation. CHART noted that consultations are unlikely in this HUC5.

ESU	Watershed Name	Watershed Code	Conservation Value Rating		Likely to be Low Leverage?	Comments
			Benefit of designating watershed	Benefit of designating connectivity corridor		
	South Santiam River / Foster Reservoir	1709000607	High	High	No	CHART noted that consultations were likely to yield significant leverage in this HUC5, noting COE activities and recent Bureau of Land Management consultation in this area.
Upper Columbia River Spring-run Chinook Salmon			No watersheds matched the profile for low leverage.			
Hood Canal Summer-run Chum Salmon			No watersheds matched the profile for low leverage.			
Columbia River Chum Salmon	Green River	1708000505	Medium		Yes	CHART concluded that this was a low leverage HUC5 and that exclusion would not significantly impede conservation. CHART noted that consultations are unlikely to provide significant leverage given the species' limited amount of habitat in this HUC5.
	South Fork Toutle River	1708000506	Medium		No	CHART noted that consultations were likely to yield significant leverage in this HUC5 given the Federal lands in the upper watershed.
Ozette Lake Sockeye	Ozette Lake	1710010102	High		No	CHART noted that consultations were likely to yield significant leverage in this HUC5, noting that this is

ESU	Watershed Name	Watershed Code	Conservation Value Rating		Likely to be Low Leverage?	Comments
			Benefit of designating watershed	Benefit of designating connectivity corridor		
Salmon						the only HUC5 supporting the ESU and citing recent consultations with the National Park Service.
Upper Columbia River Steelhead	Foster Creek	1702000503	Low		Yes	CHART concluded that this was a low leverage HUC5 and that exclusion would not significantly impede conservation. CHART noted the limited amount of habitat and that consultations are unlikely in this HUC5.
Snake River Steelhead	Little Sheep Creek	1706010204	High	High	No	CHART noted that consultations were likely to yield significant leverage in this HUC5, noting the grazing, road maintenance, and motorized recreation activities here and also citing the Imnaha subbasin consultation addressing this HUC5.
	Phillips Creek/Willow Creek	1706010408	High		No	CHART noted that consultations were likely to yield significant leverage in this HUC5, noting in particular the restoration-related consultations here. CHART noted that consultations were likely to yield significant leverage in this HUC5, noting that
	Grande Ronde River/Cabin Creek	1706010411	High	High	No	consultations have and will likely continue to occur here (e.g., Forest Service vegetation management, diversion consolidations, etc.)
	Middle Wallowa River	1706010503	Medium	High	No	CHART noted that consultations were likely to yield significant leverage in this HUC5, noting that consultations have and will likely continue to occur

ESU	Watershed Name	Watershed Code	Conservation Value Rating		Likely to be Low Leverage?	Comments
			Benefit of designating watershed	Benefit of designating connectivity corridor		
	Lower Wallowa River	1706010506	High	High	No	here (e.g., Wallowa Lake dam rehabilitation, diversion consolidations, etc.) CHART noted that consultations were likely to yield significant leverage in this HUC5, noting Forest Service and Bonneville Power Administration consultations here, (e.g., herbicide application, restoration, culvert replacement, recreation). CHART noted that consultations were likely to yield significant leverage in this HUC5, noting that this was one of the earliest model watersheds and the restoration-related efforts here (e.g., Natural Resources Conservation Service's Conservation Reserve Enhancement Program).
	Alpowa Creek	1706010701	Medium		No	CHART concluded that this was a low leverage HUC5 and that exclusion of tributaries would not significantly impede conservation CHART noted that most leverage is associated with the mainstem which would be designated as critical habitat.
	Snake River/ Steptoe Canyon Creek	1706010702	Low	High	Yes	
	Deadman Creek	1706010703	Low		No	CHART noted that consultations were likely to yield leverage in this HUC5 (e.g., via Bonneville Power Administration's funding for restoration projects and Natural Resources Conservation Service's Conservation Reserve Enhancement Program),

ESU	Watershed Name	Watershed Code	Conservation Value Rating		Likely to be Low Leverage?	Comments
			Benefit of designating watershed	Benefit of designating connectivity corridor		
	Flat Creek	1706010704	Low		Yes	although possibly not as significant as in other HUC5s. CHART concluded that this was a low leverage HUC5 and that exclusion would not significantly impede conservation. CHART noted the limited amount of habitat and that consultations are unlikely in this HUC5.
	Pataha Creek	1706010705	Low		Yes	CHART concluded that this was a low leverage HUC5 and that exclusion would not significantly impede conservation. CHART noted that consultations are unlikely in this HUC5.
	Lower Tucannon River	1706010707	High	High	No	CHART noted that consultations were likely to yield significant leverage in this HUC5, noting that this was one of the earliest model watersheds and the restoration-related efforts here (e.g., Natural Resources Conservation Service's Conservation Reserve Enhancement Program) and efforts to fix instream structures and dams as well as easements. CHART concluded that this was a low leverage HUC5 and that exclusion would not significantly impede conservation. CHART noted the limited amount of habitat and that consultations are unlikely in this HUC5.
	Lower Palouse River	1706010808	Low		Yes	

ESU	Watershed Name	Watershed Code	Conservation Value Rating		Likely to be Low Leverage?	Comments
			Benefit of designating watershed	Benefit of designating connectivity corridor		
	Big Deer Creek	1706020321	Low		No	CHART noted that consultations were likely to yield significant leverage in this HUC5, noting mining consultations here associated with the Idaho Cobalt Mine.
	Wind River	1706020702	Low		No	CHART noted that consultations were likely to yield significant leverage in this HUC5, noting consultations here related to fire management, outfitter/guides, and herbicide spraying.
	Salmon River/China Creek	1706020901	High	High	No	CHART noted that consultations were likely to yield significant leverage in this HUC5, noting Bureau of Land Management has some grazing consultations and noxious weed spraying as well as bridge consultations and fire herbicide application.
	Eagle Creek	1706020902	High		No	CHART noted that consultations were likely to yield significant leverage in this HUC5, noting (as above) Bureau of Land Management has some grazing consultations and noxious weed spraying as well as bridge consultations and fire herbicide application.
	Deer Creek	1706020903	Medium		No	CHART noted that consultations were likely to yield significant leverage in this HUC5, noting (as above) Bureau of Land Management has some grazing consultations and noxious weed spraying as well as bridge consultations and fire herbicide application.

ESU	Watershed Name	Watershed Code	Conservation Value Rating		Likely to be Low Leverage?	Comments
			Benefit of designating watershed	Benefit of designating connectivity corridor		
	Salmon River/Cottonwood Creek	1706020904	High	High	No	CHART noted that consultations were likely to yield significant leverage in this HUC5, noting recent Corps of Engineers consultation and that Bureau of Land Management has some grazing consultations and noxious weed spraying as well as bridge consultations and fire herbicide application and guide/outfitter consultations.
	Rock Creek	1706020906	Medium		No	CHART noted that consultations were likely to yield significant leverage in this HUC5, noting recent Corps of Engineers consultation and road and grazing consultations in this HUC5.
	Cottonwood Creek	1706030513	Medium		No	CHART noted that consultations were likely to yield leverage in this HUC5 (noting recent consultations) although possibly not as significant as in other HUC5s.
	Clearwater River/Lower Orofino Creek	1706030513	Medium	High	No	CHART noted that consultations were likely to yield significant leverage in this HUC5, noting likely instream work-related consultations here.
	Upper Orofino Creek	1706030613	Low		Yes	CHART concluded that this was a low leverage HUC5 and that exclusion would not significantly impede conservation. CHART noted the limited amount of habitat and that consultations are unlikely in this HUC5.

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	Middle Lawyer Creek	1706030624	High		No	CHART noted that consultations were likely to yield leverage in this HUC5 (noting recent consultations and restoration-related proposals here) although possibly not as significant as in other HUC5s. CHART noted that consultations were likely to yield significant leverage in this HUC5, noting consultations regarding Bureau of Land Management tracts and grazing issues, culvert/passage issues, and subdivision activity.
	Cottonwood Creek	1706030627	Medium		No	
Middle Columbia River Steelhead	Satus Creek	1703000305	High		No	CHART noted that consultations were likely to yield leverage in this HUC5 (noting likely consultations regarding transportation, utilities, and irrigation corridors here) although possibly not as significant as in other HUC5s. CHART concluded that this was a low leverage HUC5 and that exclusion would not significantly impede conservation. CHART noted the limited amount of habitat and that consultations are unlikely in this HUC5 (although tribes may pursue restoration activities here).
	Glade Creek	1707010105	Medium		Yes	
	Alder Creek	1707010110	Medium		Yes	CHART concluded that this was a low leverage HUC5 and that exclusion would not significantly impede conservation. CHART noted the limited



ESU	Watershed Name	Watershed Code	Conservation Value Rating		Likely to be Low Leverage?	Comments
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	Pine Creek	1707010111	Medium		Yes	amount of habitat and that consultations are unlikely in this HUC5 (although tribes may pursue restoration activities here). CHART concluded that this was a low leverage HUC5 and that exclusion would not significantly impede conservation. CHART noted the limited amount of habitat and that consultations are unlikely in this HUC5 (although tribes may pursue restoration activities here).
	Rock Creek	1707010113	High		Yes	CHART concluded that while this was a low leverage HUC5, exclusion may significantly impede conservation (noting recent Technical Recovery Team identification of a major population group here). CHART noted that consultations are unlikely in this HUC5 (although tribes may pursue restoration activities here).
	Lower Touchet River	1707010207	High	High	No	CHART noted that consultations were likely to yield significant leverage in this HUC5, noting consultations regarding flood protection/control here.
	Umatilla River/Alkali Canyon	1707010307		High	No	CHART noted that consultations were likely to yield leverage in this HUC5 (mainstem-related activities) and that this was a vital connectivity corridor with

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	Stage Gulch	1707010308	Low		Yes	upstream HUC5s as well. CHART concluded that this was a low leverage HUC5 and that exclusion would not significantly impede conservation. CHART noted the limited amount of habitat and that consultations are unlikely in this HUC5.
	Lower Butter Creek	1707010310	Low		Yes	CHART concluded that this was a low leverage HUC5 and that exclusion would not significantly impede conservation. CHART noted the limited amount of habitat and that consultations are unlikely in this HUC5.
	Upper Klickitat River	1707010601	High		Yes	CHART concluded that while this was a low leverage HUC5, exclusion would significantly impede conservation, noting Technical Recovery Team identification of a major population group here.
	Lower Middle Fork John Day River	1707020305	Low	High	Yes	CHART concluded that this was a low leverage HUC5 and that exclusion of tributaries would not significantly impede conservation. CHART noted that most leverage is associated with the lower mainstem which would be designated as critical habitat.
	Butte Creek	1707020406	Medium		No	CHART noted that consultations were likely to yield

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			Benefit of designating watershed	Benefit of designating connectivity corridor		
	Pine Hollow	1707020407	High		No	leverage in this HUC5 (noting likely consultations regarding transportation and sewage treatment here) although possibly not as significant as in other HUC5s. CHART noted that consultations were likely to yield significant leverage in this HUC5, noting Bureau of Land Management consultations here related to grazing.
	Lower John Day River/Ferry Canyon	1707020409	Low	High	No	CHART noted that consultations were likely to yield significant leverage in this HUC5, noting Federal lands consultations along the mainstem.
	Lower John Day River/Scott Canyon	1707020410	Low	High	No	CHART noted that consultations were likely to yield significant leverage in this HUC5, noting Federal lands consultations along the mainstem.
	Grass Valley Canyon	1707020413	Medium		No	CHART noted that consultations were likely to yield significant leverage in this HUC5, noting likely consultations regarding grazing and Corps of Engineers permits here.
	Lower John Day River/Mcdonald Ferry	1707020414		High	No	CHART noted that consultations were likely to yield leverage in this HUC5 (mainstem-related activities) and that this was a vital connectivity corridor with upstream HUC5s as well.
	Mill Creek	1707030604	High	High	No	CHART noted that consultations were likely to yield

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	Beaver Creek	1707030605	High		No	significant leverage in this HUC5, noting the recent pre-consultation with Bureau of Indian Affairs regarding herbicide applications. CHART noted that consultations were likely to yield significant leverage in this HUC5, noting the recent pre-consultation with Bureau of Indian Affairs regarding herbicide applications.
	Warm Springs River	1707030606	High	High	No	CHART noted that consultations were likely to yield significant leverage in this HUC5, noting the recent pre-consultation with Bureau of Indian Affairs regarding herbicide applications.
	Middle Deschutes River	1707030607	High	High	No	CHART noted that consultations were likely to yield significant leverage in this HUC5, noting that consultations with Bureau of Land Management are very likely to continue here.
	Bakeoven Creek	1707030608	High		No	CHART noted that consultations were likely to yield significant leverage in this HUC5, noting that consultations with Bureau of Land Management have occurred here as well as are very likely to continue here.
	Lower Deschutes River	1707030612	High	High	No	CHART noted that consultations were likely to yield significant leverage in this HUC5, noting that consultations with Bureau of Land Management are

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Lower Columbia River Steelhead	Antelope Creek	1707030702	Medium		No	very likely to continue here. CHART noted that consultations were likely to yield significant leverage in this HUC5, noting consultations with Bureau of Land Management and Natural Resources Conservation Service. CHART concluded that this was a low leverage HUC5 and that exclusion of tributaries would not significantly impede conservation. CHART noted the limited amount of habitat in this HUC5 and that there had been no known consultations in this HUC5 and none were expected.
	Mud Springs Creek	1707030704	Low		Yes	CHART noted that consultations were likely to yield significant leverage in this HUC5, noting that the Corps of Engineers have considerable instream activities here.
	Lower Trout Creek	1707030705	High		No	
	Green River	1708000505	High		No	CHART noted that consultations were likely to yield significant leverage in this HUC5, noting the species' spawning habitat overlap with Federal lands in the upper watershed.
	South Fork Toutle River	1708000506	Medium		No	CHART noted that consultations were likely to yield significant leverage in this HUC5, noting the species' spawning habitat overlap with Federal lands in the upper watershed.

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Upper Willamette River Steelhead	South Santiam River / Foster Reservoir	1709000607	High	High	No	CHART noted that consultations were likely to yield significant leverage in this HUC5, noting COE activities and recent Bureau of Land Management consultation in this area.
	Lower South Yamhill River	1709000804	Low	Medium	Yes	CHART concluded that this was a low leverage HUC5 and that exclusion of tributaries would not significantly impede conservation. CHART noted that most leverage is associated with the mainstem which would be designated as critical habitat.